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WE have from time to time given somewhat lengthy accounts of the progress of the movement toward erecting a battle-monument at Bennington, Vt., because the manner in which those who were unselfishly taking a great deal of trouble in the matter seemed to us so much more intelligently directed than is usually the case, and we thought it only proper to practise what we preach, and give them as much encouragement as we could. More than this, we have more than once abstained from criticizing with severity some of the steps taken, which seemed to be in direct opposition to the principles which we had been given to understand had been adopted by the ruling minds amongst the Monument Association. It may be remembered that a year ago we spoke of the design for the monument which had been accepted, and based on the description of the design which was published in the daily prints, some rather approbatory comments on the manner in which the designer seemed to have treated a hackneyed type in a rather more architectural fashion than is usual. When, some months afterwards, we saw a small photograph of the accepted design, we regretted that we had not spoken more guardedly, or rather, had not made our remarks abstract rather than concrete. The design showed an obelisk-like shaft, crowned by an indescribable feature, a semi-Gothic pyramidion, if there be such a thing, while about the base on one side was a structure which corresponded closely to the huddle of engine-room and machine-shop that we usually find about the base of a water-works stand-pipe. To speak plainly, we were disappointed that so much apparently well-directed effort should not promise to produce a better result. It seemed clear to us that a structure of this kind in an isolated and rugged position, with nothing to give it scale, bade fair to be weak and ineffective. Still the die seemed to have been cast, and nothing more was to be said. Lately, however, steps have been taken to begin the work of erection, and it has been voted to put in a foundation for a monument three hundred feet high (the accepted design showed a shaft of this height), but it is said to be expressly understood that the Association reserves to itself the right to "improve on the design, till it reaches and passes the spot where improvement is impossible." This is a wide reservation, and may mean little in the way of change or it may mean much. At any rate it seems to place the unfortunate designer completely at the mercy of the Association, though at the same time it relieves him of some of the odium of failure, if that should chance to be the outcome of these associated efforts. The Association professes that it has not accepted a definite design, and intends to improve on whatever one may actually be begun, yet it is ready to use a portion of its laboriously-collected funds for a foundation for "a monument three hundred feet high." To us the facts that the foundation suitable for a monument three hundred feet high is not suitable for a monument of any other dimensions, and that any change of design after the foundation is laid must inevitably create the alternatives, waste through excess of strength, or danger of failure for want of it, are of grave importance. If the one designer fitted above all others for the work has been discovered—as certainly should have been the result of so much time, care and research—he is the one man in the world whose design should not be "improved" after work has begun. Once work has begun, the less a designer is interfered with, the better the finished work—usually.

A VERY curious sociological, as well as artistic question presents itself in the steps that are being taken to call a convention of the colored people at Philadelphia, to take measures for securing the erection in Washington of a million dollars' worth of statues and monuments to the memory of the white men who strove so nobly to secure their freedom — to Brown, Phillips, Garrison, Sumner, Lincoln, and others. It would be a singular revelation of the real value of emancipation from servitude, if it should be discovered that within thirty years of receiving their freedom the colored people of this country could raise a million dollars for this purpose before the city of New York could raise a similar sum to build its memorial to General Grant. As to the effect on the city of a million dollars' worth of bronze or stone images of those who first hailed the negro as man and brother, we cannot form any opinion, as it is not said whether, like contracts under a party government, the jobs would not be given to "outsiders," that is, to white sculptors; but as we know of but one colored sculptor, and that one a woman, we do not believe that the matter of race will determine the selection of the sculptor. If it is found possible to raise the money, we think it possible that we might learn another lesson from these unsophisticated but grateful brothers, who, acknowledging their own ignorance of matters of art, might yet have the intelligence to seek out the best men, and place the jobs unreservedly in their hands, so that the result might be the acquisition of a number of really good statues such as could not possibly have been erected under the mischievous interference of the usual white art-committee. As to the possibility of raising this sum or any large sum for such a purpose, M. de Lesseps has again and again showed what a mine of accessible wealth lies hoarded in the stocking-feet of the laboring classes, and it is just possible that the barefooted southern negro may have some corresponding storage place. The negro is grateful, imaginative and generous, and it is quite possible that the sum named could be raised easily and rapidly if an appeal could reach the different individuals without delay or the expense of a personal canvas.

MR. WILLIAM WHITE, F. S. A., delivered a lecture recently before the Architectural Association, upon the brick towers of Bologna, particularly the famous Asinelli and Garisenda towers, which seems from the *Builder's* account to have contained a great deal of interesting and valuable matter. Considered as works of architectural art, Mr. White treated them, as it seems to us, very judiciously, neither exhibiting his rhetoric in ridiculous rhapsodies over qualities which no one except himself ever saw in them, nor condemning them, like some modern critics, as being altogether destitute of design. The fact is, just as Mr. White says, that the lower portion of the Bologna towers, like those of Siena, Florence, and a dozen other places, were intended to rise from the midst of a cluster of lofty houses, crowded along dark and narrow streets, where anything like detail would be thrown away, and as a natural consequence the lower portion was made solid, but plain, as befitted both the situation and the purpose of the structure, while the top, which was visible for a long distance around, was treated with singular effectiveness, as well as sobriety. There are no deep mouldings, as Mr. White says, no startling or difficult projections of string-courses or cornices, but the horizontal divisions are sufficiently marked, in some cases by the external offsets which the Italians use so cleverly, and the upper story is usually distinguished by some surface decoration, which, without breaking the simplicity of outline of the tower, gives to

it all the richness which an object of the kind, intended to be seen from a distance, ought to have.

SOME time, when the artistic history of tower-building comes to be written, there will, we imagine, be found to be a curious relationship between the treatment of the mediæval Italian towers, and those built by the Moors at nearly the same period, of which the Giralda at Seville is perhaps the best-known example, and, although its upper story is a Renaissance restoration, undoubtedly shows almost unchanged the profile and general treatment of the original. The Moorish towers are very unlike those of Italy, having the upper portion of their square shafts covered with a diaper decoration in low relief, in moulded brick, while the upper story is very much broken in outline; but the Moorish towers are very high, and the same instinct which led the architect of the Siena market tower, for instance, to band his belfry-story with colored stone, instead of chopping it up with string-courses and projections, induced the Moors to cover the upper half of the shaft of the Giralda with beautiful surface ornament only, while the belfry, three hundred feet from the ground, on which surface ornament would be nearly lost, was given by its silhouette that richness which the Italian, in his smaller building, could get by color, heightened, perhaps, by the simple change from square to octagon, which two or three of the towers present, or by the rich cornice which is found in many others.

A CURIOUS question aroused by the study of the Bologna towers, both of which lean somewhat from the vertical, is whether the movement has proceeded from the yielding of the foundation or of the soil. It is probable that the yielding of the soil is responsible for it, and it would appear also that the footings must have reached, on the lower side, a hard stratum which prevented them from further sinking, and has kept them in their present position for five hundred years. At the present time, the use of concrete, the great modern material, has enabled us to overcome many of the dangers of unfavorable subsoil, but we do not know everything that is to be known about the subject, and the investigation of the construction of the Pisa and Bologna towers could not fail to be interesting and valuable. To show how many expedients occur to observant builders under such circumstances, Mr. White relates a story of one who had occasion to build a high factory chimney on a bad soil. The chimney had been built twice, and had fallen down each time, but the contractor in question, after thinking over the problem, agreed to make himself responsible for the security of the structure. The site was on the bank of a stream, and the excavation showed the ground to be of very unequal texture and resistance. It might have been possible to test each portion separately, and proportion the footings to the resistance beneath them, but this builder prepared to meet the difficulty by concentrating the weight of the chimney on as small a space as possible, so that, although it might sink, the inequality of pressure between the different portions of the base would be slight, and, being concentrated, instead of spread out in the usual form, such irregularity of pressure as might exist would have less power of dislocating the foundation. With this idea, he procured a large block of granite, which was roughly shaped into the form of a pyramid, and set in the bottom of the excavation with the point down. On the upturned base the walls were started, battering outward, until they reached the size required, and the chimney was then built upon them in the usual way. The form of the structure seems to have resembled that of an uncut cigar, stuck in the ground with the mouth-end downward, but the designer's object was attained, and, although the chimney sank eighteen inches by its own weight, the sinking was vertical, and the structure remained upright.

DURING the last year or two we have at regular intervals introduced our readers to lithographic reproductions of the works of some of the masters of architectural etching, and though these reproductions lack much of the depth and brilliancy of the original, we feel that the series has formed an interesting feature of our illustrations. It has not, however, yet included a specimen of the work of François Maxime Lalanne, who has just died at Paris at the age of fifty-nine, and who for many years held an enviable place in the ranks of French artists. As he was a frequent contributor of etchings to the *Gazette des Beaux-Arts* and to *L'Art*, his work may be familiar to those who make it a habit to associate the name of the artist with the work he produces. Although, perhaps, most successful as an etcher, he also practised successfully as a painter, lithographer and engraver, and moreover was especially skilled in handling charcoal and pen-and-ink. Of the several handbooks he wrote on the best methods of practising these arts the one on charcoal-drawing is probably best known. Among his best known original etchings are his series of "Grandes vues de Paris," and his twelve sketches taken from the bastions during the siege of Paris in 1870–1. He was honored both in his own country and abroad, receiving medals at several of the international exhibitions, and was a member of the Academies of Fine Arts of Paris, Brussels and Bordeaux.

CONSIDERING the possibilities, the introduction of the electric-light to public use has been attended by very few accidents: an occasional fire caused by an unprotected wire, a shocked horse, a fireman disabled or killed by coming in contact with a wire, or a victim of his own careless thoughtlessness, these mischances are not so often heard of as they were a year or two ago, and the fact speaks well both for the care and diligence of the employés of the electric-light companies, and for the discretion of the public. But this week has witnessed a new form of disaster with which the public can be visited by reason of the adoption of this useful system of lighting. On Monday the works of the Brush Electric Illuminating Company, on Elizabeth Street, New York, were destroyed by fire, which may have been occasioned by the electric current, by friction, or by any of the ordinary incendiary causes. The only special interest the accident has, is that because of it a large portion of the city was deprived of its nightly light. An accident to a gas-works might create as wide-spread an inconvenience, and yet could not be so easily remedied, so that the destruction of the Brush Company's large plant—forty-five dynamos, which fed twelve hundred lights, were destroyed—affords one argument in favor of the general adoption of the electric-lighting system. In a very short time connections for a large portion of the extinguished lights were made with the Company's station at Twenty-fifth Street; so if no accidents are occasioned by sending a current of unusual force over the trunk-line from this station, because of having to serve a number of lights beyond its normal capacity, the public will suffer less through the fire than through an accident of equal gravity to a gas-works.

SOME curious information is given in *Le Technologiste* about the paper bags for flour which are so extensively used in this country for retailing to the poorer classes of people. Some twenty-seven years ago a manufactory of flour-bags of cotton cloth was established in New York State. The business prospered, and the establishment had grown to be a large one, when the war broke out, and the supply of cotton cloth was soon cut off. The proprietors of the manufactory set their wits at work to find some other material of which they could make satisfactory flour-bags, and naturally thought first of paper, which had been long in use for smaller packages. No paper could, however, be found strong enough to hold the weight of the flour to be put into the bags, and the firm was obliged to begin at the beginning, and devise a new sort of paper which would be suitable for their purpose. The strongest material for paper was soon discovered to be hemp, but hemp in its natural condition was too stiff and brittle for paper-making, and it was only by various mechanical and chemical processes that it was finally subdued to the requisite pliability, and a paper was made of it which possessed immense strength, a strip three-quarters of an inch wide of the sort now used for flour-bags being capable of supporting a weight of two hundred pounds, while a strip of heavy cotton cloth of the same width will break under a load of twenty-five pounds. The bags of the new paper proved extremely popular; their sale increased from year to year, until the capacity of the establishment, to keep pace with the demand, has been extended to a production of thirty-five million bags per annum; and the firm, to supply its material, carries on three paper-mills, which produce twenty thousand pounds of paper a day from old manilla ropes, brought from New York by boat. The bags are made by machines, which roll the paper into long tubes, paste the seams, cut the tubes into lengths, and fold the lower edges, ready to receive the bottom piece, which is pasted on by hand.

STROLLS ABOUT MEXICO.[1] — XIII.

A DAY IN TEXCOCO.

The Fountain, Texcoco.

IT was an early hour on an October morning when we set out for a trip to Texcoco, and a sharp chill filled the air, for it is usually chilly in the City of Mexico until the sun is well above the low-lying mists that brood over the valley levels, and are settled down in the thin atmosphere. It was a long way from the plaza out to the station, and we sat shivering in the street-car, with empty stomachs, for the cafés had not opened their doors. We shivered still as we sat in the train waiting for it to start, but we made the best of it, for we knew it would be warm enough before long, and to lug around overcoats all day would be a nuisance outweighing our temporary discomfort. It was a narrow-gauge railway under native management, and the cars were shabby beside the handsome equipages of the Central and National Railways. There were but two classes, and we sat uneasily upon the hard wooden seats of the first-class coach, and as we watched the peons crowding into the second-class, we almost wished that we had followed the temptation to join them, for in their cars there were open sides, and the seats consisted of transverse benches, as in our open street-cars, giving a jaunty, picnic-like appearance. The train started at seven o'clock, and the sharp draught that obliged us to shut the open window promptly relieved us of any remnant of a longing for a change that we had cherished. Frozen to death in the tropics, might have been the verdict, otherwise, and all enlarged enjoyment of the landscape would soon have been turned to mourning. We crossed the desolate flats that were formerly covered by the lake, and which merged in that dreary sheet so gradually that we could hardly see where the shallow waters began to stretch away on their expanse of twenty miles or more. The monotony of the region might have made it a good subject for an illustration of Hades, were it not for the nobility of the near mountains which we were rapidly approaching; the two magnificent great volcanoes gleaming in snow-crowned royalty, splendid in the early sunlight, which threw grey shadows over their hither slopes. We reached Texcoco at half-past nine o'clock, and knowing it to be the headquarters of that division of the railway, we recognized the place by the fact that as we slackened speed in approaching the station, we passed a number of crippled locomotives awaiting opportunity to enter the repair-shop, like patients about the door of a charity hospital.

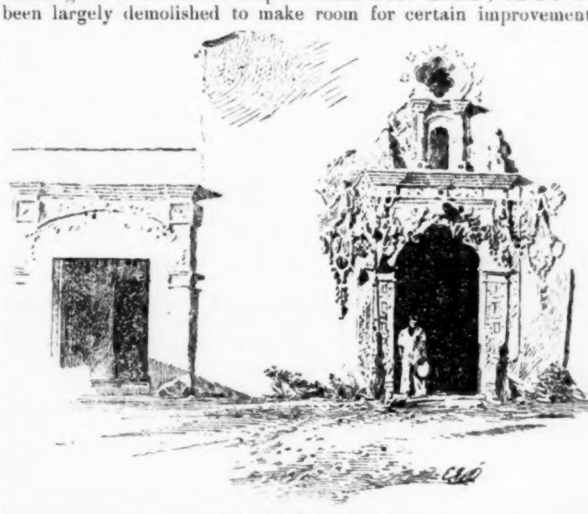
Among the expectant crowd at the station, we selected a comely lad, slender and straight—an Indian, of course—as guide and luggage-carrier. A gleam of white teeth lit up his brown face as he answered "Ignacio," in response to our question as to his name, and took charge of the camera, handing the tripod over to an urchin, whose brown skin showed through the scanty rags which played over it, as clouds play above the earth. Mexican-like, Ignacio had engaged this boy to help him, for a Mexican servant will, if possible, hire a servant of his own to lighten his labors.

"Now, Nacho; *a la fonda para desayuno*" (to the restaurant for breakfast), and we were guided down a handsome broad avenue, leading into the city, and lined with rows of the buncey little trees with formally-trimmed crowns, much affected in Mexico, and more decorative than shade-giving. The plain-fronted houses, mostly of one-story, had an affluent look, with beautiful court-yards visible through open doors and, often, spacious gardens in the rear, and we were told that they were the homes of "*altos particulares*," or "exalted individuals," which formal bit of Castilian seemed quite applicable to what we felt inclined to accept as the nobility of the realm of Nezahualcoyotl, the rival of proud Moctezuma, whose capital Texcoco was. Texcoco seemed to have that indescribable, yet very definite air of intense respectability often maintained by small old cities in the neighborhood of great capitals, whose rivals they are in age and historic glories, though long since overshadowed in importance. Texcoco had been in railway communication with the neighboring capital of the republic but two or three years, and though a prosperous place, the seat of some manufactures, including a very profitable glass-factory, it still seemed to slumber in a restful atmosphere, little disturbed by the affairs of the world at large. It struck me as a kind of Mexican Salem, and I was not surprised that it, also, had its "institutions," one of which was an academy for the study of the old Nahuatl tongue, the language of the Aztecs.

[1] Continued from Vol. XIX, No. 546, page 285.

Ignacio led us around a corner to the principal hotel of the place, and an admirably kept one it was, the proprietor being a Frenchman, a shining example of the Bonifacial talents of his race. Refreshed with a *desayuno* of coffee and rolls, both excellent, we sallied forth to see what we could see. We found the Zócolo, or central garden of the city, unlike most places of the kind, occupying the midst of the main plaza, but it was a walled enclosure adjoining the market-house. Hardly so well kept as usual, it had a charm of quiet neglect, with its tangled shrubbery and flowers, amid which stood some fine old idols carved in stone. Near by was the parochial church of San Francisco, a magnificent old edifice with some peculiarities which gave it a decided architectural individuality, most notable among them was the portico, with its finely-proportioned large and small arches. An old crone appeared from somewhere, and showed us through the church, and out into a little *campo santo* with walls dazzling in a coating of fresh whitewash, and the usual hideously tasteless tombstones, which, for some reason I have failed to discover, are in all Latin countries the most tawdry and unpicturesque objects to be found. The old lumber-room through which we passed, was, however, a treasury of *bric-à brac;* dusty old ecclesiastical paintings, and a miscellany of wooden carvings of saints and angels, heavily gilded and richly painted, all piled in confused heaps. Those representing the afflictions of martyrdom had the customary horror-inspiring features which recalled to me the amusement that I once derived from the consternation with which a good Puritanical New England lady fled from a similar lumber-room in an old German church, into which I had inadvertently led her, while showing her the lions of the place.

We clambered to the tower, and the hour which we spent there, basking in the sunshine and drinking in the beauties of the landscape, will always linger as a happy memory. The large lake was just far enough away to give it the enchantment of distance; wholly a thing of beauty. Away across on the other side rose the towers of the great city, which, lying so low, seemed to rise glittering from the blue *lago* like Venice from the lagoon; above towered the dark, lofty wall of the Sierra de la Cruz, over which was lifted the gleam of one snowy peak, the Nevado de Toluca, which was invisible from the capital. There was a particularly fine view of the two great volcanoes; a characterization. however, which seems to apply to almost every sight of those mountains when beheld from a new standpoint. "Where is Texcotzingo?" we asked, and Ignacio pointed out to us a cone-shaped hill a few hundred feet high rising four or five miles away to the eastward, and overshadowed by a mountain-range at whose feet it stood. So that was the site of the famous country palace of Nezahualcoyotl, enchantingly described in Prescott, and, I fear, unintentionally somewhat exaggeratedly! But we did our best to fancy it still occupied, with terraced sides splendid with sculpture, flowers, and sparkling fountains, and all the luxuries at the command of barbaric magnificence. We did not have time to visit the hill, but a friend who had been there was eloquent over the beauty of the site and the view, though he said there was nothing to tell of what it had been except a few fragments of sculpture. We found no difficulty in distinguishing the site of Nezahualcoyotl's town palace in the shape of a huge mound, which. we were told, had been standing but little disturbed up to within a few months, when it had been largely demolished to make room for certain improvements.



Chapel Doorway, Texcoco.

The superincumbent palace had been destroyed in the early days of the Conquest. The church from which we looked was, among other buildings, constructed of its stones, the sculptured faces of which, it is said, were turned inward in the walls. We visited the spot when we left the church. It was but a few streets away, but we found nothing of interest in the shapeless heap of small stones and gravel.

Truly, Texcoco was a goodly kingdom and fair to look upon, we thought, as we still stood in the belfry and gazed over the glorious landscape. It was not difficult, after all, to fancy it a "kingdom,"

as kingdoms went in olden days, for, in my school years, I had gained a rather small idea of the domains of the classic monarchs about whose incessant squabbles and depredations I read in ancient history, and my boyish standard of comparison for the relative importance of their territories lay in the various vacant lots, cow-pastures, huckleberry-patches and corn-fields about the town, which I proceeded to designate mentally as Macedonia, Thessaly, Sparta, etc. I think the insignificant showing made by Greece on the map of Europe helped me to this estimate. So, when iconoclastic archæologists proceeded to strip Prescott's Mexico of its romantic glamour and degrade its mighty empire and plucky kingdoms to Indian districts, its massively-built capital cities to huge pueblos, its monarchs to chiefs and sachems, I took out my revenge in applying the same standards to classic antiquity, including the Iliad and its events. Indeed, it does not seem as if the notable researches of Schliemann revealed a state of things much superior to that of the reign of Moctezuma.

Descending to earth again, we resumed our stroll about town. A plain little chapel standing by itself in the church-yard had one feature of interest in the shape of an elaborately sculptured doorway, highly Rococo, and flanked by two queer angels, each with a palm branch. These branches had the effect of huge quill pens with which they proposed to inscribe the records of the sinners who passed below.

Another interesting architectural feature was a fountain at a street corner; a structure with walls rising as high as the adjacent houses; two large archways giving access to the huge basin within. Above was a copy of the ancient Roman statue, the Tiber. The open terra-cotta work of the coping is a common feature of architecture in Mexico, giving a light, aerial elegance to the sky-line of an ornate structure.

Though the glories of Texcotzingo have departed, it might be said that they have not flown far, for there is a delightful rural paradise near by in the shape of the garden of the Molino de Flores. It was Sunday, and when we visited the only livery stable in the city we found that all the teams were employed. Carriages are scarce in quiet Texcoco, and none was to be had, so we decided to walk. Although the sunshine poured down ardently, we did not regret our decision, for it was a pleasant stroll of a league or so through the maguey fields, the ground gradually rising until we gained an extended prospect back toward the city. When well out of town we paused to rest and refresh ourselves with a large package of delicious fruit, bought in the market-place.

We saw nothing of our destination until we reached the summit of the rise and viewed the road winding down toward an *arroyo*, or ravine, the upper part of which was brimming with a stream of leafage winding out of the hills above. We soon descended and came to a stone bridge beyond which were the buildings of the place; a village of the employés' cottages on irregular terraces along the steep sides of the ravine. We entered through a paved court where there was something of a bustle of peons, donkeys, and mules. Beyond rose a chapel dome and the mill buildings were visible through an arch, under which we passed and obtained entrance to the garden by the formality of an application at the counting-room. Could a mill in our own country be imagined surrounded by such loveliness? The owner was a wealthy Spaniard, Señor Cervantes, a gentleman of fine taste and a passion for rural beauty, as his work here showed. Water gushed wildly out from passages under the massive buildings, and tumbled, rushed, and rippled in various moods on all sides, coursing through the garden in mossy channels, its babbling echoing all around like naiad voices. The order was perfect, and though it was well along in the dry season, the grass was fresh and green, sprinkled from hose attached to inconspicuous hydrants at frequent intervals. The paths wound around among the trees into charming nooks. The grass was starred with sweet violets which filled the autumn air with springtime fragrance. The solitude was that of a mountain glen. The wild stream of clear water, fed by the perpetually melting snows of Ixtaccihuatl, came rushing down its steep descent in many cascades. Fortress-like retaining-walls bordered the stream, and a bridge crossed to a mortuary chapel on the other side, the spick-and-span newness of which seemed hardly in keeping with its surroundings.

We whiled away the mid-day in the garden, and were so refreshed that the walk back to the town brought no fatigue.

On our return by train to the capital we tried the open second-class cars, and, in spite of the dust which almost smothered us, enjoyed the unhindered views. The last sight of the snowy volcanoes, roseate with Alpine glow against the eastern purple as we drew near the city at nightfall, was alone enough of a reward.

Sylvester Baxter.

An Ancient American Pavement. — A party of land prospectors recently came upon some ancient works in this county. They first found what appeared to be the ruins of an old well, walled up with stones, in which a moderate supply of cold water was found. They removed the stones, which had caved in, to a depth of about three feet. Further examination revealed the fact that the ground around was regularly paved with stones for at least an acre, varying from three feet deep in the centre to a foot at the outer edges. The stones are covered with moss, which may be rolled up like a blanket, disclosing the stone as clean as if water-washed. The country about is timbered, and trees two feet in diameter are growing above the ruins, while the forms of a prior generation of trees even larger lie in moss and decay at their feet and above the ruins also.— *Shawano (Wis.) Journal.*

AN EDITOR'S TRIP ABROAD.—IX.[1]

SWISS CHALETS AND CHURCHES. — THE RUSSIAN CHAPEL AT GENEVA. — THE DUKE OF BRUNSWICK'S TOMB. — CHURCHES.

Choir Stall in the Church at Brou.

There is a fascination about an inhabited and fertile valley in the midst of high mountains, which it is difficult to resist, and one must, it seems to me, live a long time in Switzerland before he can sufficiently separate the architecture of the country from its surroundings to be able to criticize it intelligently. For the ordinary tourist it is perhaps enough to remember that, according to Viollet-le-Duc, who spent his summers there for many years, and was thoroughly familiar with the subject, the Swiss construction in wood, such as is now mostly seen in the German-speaking part of the country, is essentially the same as that practised by the Aryan ancestors of the Indo-European races, in their original home in the Himalayas. Their descendants either colonized or conquered the Swiss valleys, together with the rest of Europe, and he thinks that in these secluded portions of the world there has been little change in the methods of building for five or six thousand years, and perhaps much longer. Five thousand years is a long time for the duration of an architectural fashion, but one can easily believe that Viollet-le-Duc is right. Some years ago I came across a half-finished house in what was then a rather unfrequented valley in the Bernese Alps. The walls, built of hewn logs, halved together in the ordinary Swiss manner, were nearly done, and the timbers for the roof were on the ground. These were roughly carved at the outer ends into heads of different shapes, and were notched and dovetailed so as to frame together perfectly, with pins at the joints. When these were on, nothing would remain, to complete the house in the usual way, but to lay horizontal poles over the rafters, with pieces of bark on these, lapping like shingles, and more poles on top, holding down the whole by the rows of stones so familiar to every one in Swiss houses. The window-sashes would, it is true, need iron hinges, but with the exception of these, which may be conceded to be a modern innovation, and are dispensed with in the humble sort of buildings, there was nothing in the construction of the house that could not have been executed without the use of metal, and one can easily believe that an intelligent barbarian, with tools consisting of flints tied to sticks, and with plenty of time on his hands for ornamenting his dwelling, might not only frame his house with the same sort of notching and dovetailing, but would carve it all over with just the sort of Polynesian decoration that nearly covers, even at the present day, so many of the old buildings about Interlaken and Brienz.

Although hundreds of these ornamented houses still exist, it seemed to me this year that their number had diminished, while the houses which were taking the place of the old ones were of a very different character. There were plenty of brand-new châlets, with scroll-work in conspicuous positions on the outside, but one band, of gigantic proportions, was often made to cover the space which in an old house would be occupied by four or five bands of different design, and while the old work was invariably carved on the solid piece, the new sculpture was in most cases evidently sawed out of a thin veneer, and tacked on with little nails. Even the old houses themselves, where fire and decay had spared them, were rapidly being metamorphosed by the fatal process of shingling into objects which, if still picturesque, gave no hint of the beauties which lay concealed beneath their scaly covering. Like the rest of us, the Swiss prefer to be warm in winter, and there is no doubt of the fact that squared timbers, laid simply edge to edge, and subjected to the seasoning and warping of a century or more of sun and rain, admit an unnecessary amount of fresh air during cold weather, which can be kept out by a good triple layer of shingles, and we can hardly blame the owner of

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[1] Continued from page 74, No. 555.

a sculptured house, if, on comparing the satisfaction which he derives from the contemplation of the carving on his dwelling with that which his neighbor takes in the reduction of his bills for fuel, he decides at last to sacrifice the artistic and historical interest of his house to the comfort of his family.

If, however, the old Swiss architecture seems likely to disappear gradually from the portions of the country most frequented by strangers, there is comfort in the reflection that some of it will be replaced by work of another sort of artistic interest. It is natural enough that the seat of a great architectural school should be distinguished by the prevalence of a good style of design, and at Zurich the good seed scattered from the Polytechnic School on the hill seems to have found an exceptionally favorable soil, and to have sprung up into a remarkable growth of well-studied, beautiful and interesting buildings. At Geneva, although the new quarter of the city contains some pretty houses, showing a cleverness and originality of treatment which was very probably due to Zurich training, the more important architectural productions of recent date are rather disappointing. Although I did not see the inside of the new theatre, the gift of the Duke of Brunswick to the city, the outside seemed to me to show a respectable acquaintance on the part of the architect with other modern theatres, and not much more; while the Brunswick Memorial, although it pleases one by the evidence it gives that the citizens were grateful enough to their benefactor to spend a good deal of money on his tomb, has little further attraction. The guide-books seem to think that they help the credit of the monument by saying that it is copied from one of the Scaliger tombs at Verona, but it is only fair to its designer to say that it is very far from being a copy of that or any other structure, and it comes perhaps as near to being either original or successful as the Albert Memorial in London, which it somewhat resembles.

The third of the newer Geneva buildings of importance that I saw was the Russian church, or rather chapel, as it is a tiny affair, only large enough to accommodate a congregation of about fifty, and owing its striking appearance, which distinguishes it at a great distance among the other buildings of the city, more to its elevated situation and the singular appearance of its twisted and gilded domes, than to its size. A Tartar church would be a novelty anywhere in Western Europe, and the architect needed only to cover his building with onion-shaped roofs and golden chains to be sure of exciting the admiration of the crowd; but apart from these the exterior, with its red and white striped walls and good detail, is pretty and interesting. Inside, one's sense of the architectural forms is lost in the richness of the decoration and furnishing. The church proper consists of little more than a square box, without columns, or even seats to furnish it, covered with a dome and preceded by a porch. A sanctuary, rather more than a semi-circle in plan, opens out of the church, but this is kept shut off except during divine service, and contains little in the way of decoration. On the side toward the auditorium, however, the doors and their frames, which are of cedar of Lebanon, are very richly sculptured, and there are pictures and other objects enough on the walls to give the whole room a curious interest. Two of the pictures, by a Russian artist whose name the sacristan could not give, interested me very much. Both of them were single figures, representing female saints or angels, with intensely Russian features, the hair almost white, the eyebrows black, and the complexion chalky, but the feeling of the artist had transfigured even these unaccustomed materials, and more beautiful or saintly figures one rarely sees painted. In contrast with the modern works were two very ancient Byzantine pictures, hideous enough to suit the most ardent antiquary, but set in frames of solid gold, lavishly ornamented with diamonds, pearls and rubies. I do not pretend to be a very good judge of the price of precious stones, but I should say that, apart from the gilding on the domes, the thickness of which I could not tell, the value of either of the frames would have paid the cost of the church, yet the sacristan exhibited them as unconcernedly as if they had been of pine wood. Without containing quite so much preciousness within a small space, the rest of the fittings of the church were equally sincere and satisfactory. The steps to the sanctuary were covered with a carpet which, although patched, was embroidered over every square inch; and, small as it was, the church gave an impression of richness far superior to that which one derives from interiors covered with the tinsel which so many saints are supposed to be unable to distinguish from solid metal.

As a rule, however, the air of mountain districts, or, perhaps, the sharpness of vision which mountain climbing promotes, seems to be unfavorable to the growth of a taste for tinsel, and the churches of all denominations in the Alpine districts are remarkably unpretending. At Domo d' Ossola was a little church which, except for the inscription over the door, dedicating it to "Mariæ Virgini ad Nives," and for a certain ecclesiastical look about the altar, would have answered very well for a Cape Cod meeting-house, and no meeting-house could have been more simple in the arrangement of the pews and pulpit. At Martigny was a rather pretty church, equally simple in its arrangement, but with a very richly-carved door, and some pretty wrought-iron work, and Chamonix also possesses a curious building of much the same character. The great Swiss cathedrals are to my mind, I must confess, rather uninteresting. They are, except that at Constance, practically French as to their construction, and the construction is the least beautiful, although not the least interesting part of a French cathedral of the thirteenth or fourteenth century, while the lovely detail, which, in France affords the architect continual pleasure, is found only in limited amount in the great Swiss churches.

Between the ecclesiastical buildings of Munich and those in the mountains there is certainly an instructive contrast. The value of incense-smoke as a factor in architectural effect had never occurred to me until I witnessed a service in the Church of St. Michael. According to the guide-book, this was built by the Jesuits, and afterwards used as the royal chapel of Bavaria, but nearly everything about the interior still retained the peculiar character of Jesuit architecture. The walls and ceilings were pure white, with the usual extravagant relief work, rather sparingly decorated with gold, and an immense reredos, something like a baldacchino flattened out, and pretty liberally gilded, rose behind the altar nearly to the roof. A picture, which seemed to have no small merit, was set in the middle of the reredos, where its effect was almost totally destroyed by the glaring white about it, and other pictures hung, like blots, on the dazzling walls. Rich as the building was, the interior seemed very crude and disappointing until the censors began to swing briskly. The first wreath of smoke changed the aspect of affairs a little, and in a few minutes the choir was transformed. The staring reredos appeared to retreat backward to a vast distance, and beyond the line of moving priests it seemed like the apparition of some heavenly structure, while the transept recesses filled with a soft blue haze, which brought the white and gold, with the shadows and "carnations" of the pictures, into tolerable harmony. As the smoke was dissipated in the intervals of the service, the raw look came back into the church, to vanish again as more incense celebrated the conclusion of the sacrifice.

LANDLORD'S LIABILITY FOR BAD DRAINS.

Rough Sketch of the Van Rensselaer Mansion. Albany N.Y

THE old question of the responsibility of a landlord for the defective drainage of a house which he had let to a tenant came again before the High Court in the dase of Bartram *vs.* Aldous, which was the first case tried before Mr. Justice Grantham. The case is specially instructive, as the fact of the house being in an unsanitary, state was not disputed. Evidence, which was admitted to be accurate, was given to show that the waste-pipes from the bath-room opened direct into the main sewer, and that the house-drains were untrapped. The natural consequence was that sewer-gas escaped into the house, and the tenant's family became ill. Under these circumstances he refused to pay two quarters' rent which was due, and brought a counter claim for the damages which he had sustained through becoming tenant of a house which was uninhabitable.

By English law a landlord who lets a house does not ordinarily warrant that it is fit for habitation. The tenant is supposed to make inquiries, and ascertain the material facts for himself; and if he makes a bad bargain, so much the worse for him. The fact of the drains being defective, of itself, affords no answer to a claim for rent, and Mr. Aldous was obliged to rely on a representation which he alleged the landlord to have made at the time of letting the house, to the effect that the drains and water-supply were both perfect. On the question of this representation having been made there was a conflict of evidence, and the jury gave their evidence in favor of the landlord. Whether this verdict was right or not is a matter which does not concern us here. The case shows plainly that a tenant of an ordinary house cannot, *after he has made his bargain,* impose on his landlord the additional liability of providing proper drains. There are, no doubt, exceptions to this rule. It has been decided that a landlord who lets a *furnished* house, impliedly warrants that house to be fit for habitation, and that he may therefore be liable to pay damages consequent on its not being so. The Housing of the Working Classes Act of last year, 48 & 49 Vict. c. 72, sect. 12, also provides that in any contract "for letting of habitation by persons of the working classes, a house or part of a house, there shall be implied a condition that the house is at the commencement of the holding in all respects reasonably fit for human habitation." Neither the Legislature nor the judges have seen fit to incorporate any such condition into contracts for the letting of houses of a superior class, and there the intending tenant must protect himself. This he can do by having the house surveyed before he becomes tenant, when, if his surveyor is competent, any gross sanitary defects are likely to be detected. He might also insist on the insertion in his lease of a covenant by the landlord that the drains, etc., are, and shall be kept in a proper condition. Such a covenant is at present unusual, and the landlord's solicitors would probably for that reason object to its insertion. But if the intending tenant insisted, and the house was in

such a state as to comply with the requisition, the covenant would most likely be conceded: if the landlord's agents persisted in refusing, that fact should certainly be sufficient to raise a suspicion that the house was not altogether fit for habitation. Too often landlords let, and tenants take houses without giving any real thought as to their sanitary condition. Greater attention at the time of letting to the duties and to the risks which they respectively incur, would save many disputes and much subsequent unpleasantness, and would be beneficial to the health of the community.—*Sanitary Record.*

THE ILLUSTRATIONS

Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

THE ROTCH TRAVELLING SCHOLARSHIP DRAWINGS. — PLATES XXI, XXII, XXIII.

[Issued only with the Imperial edition.]

THE BAYARD BUILDING, KANSAS CITY, MO. BUILT FOR NATHANIEL THAYER, ESQ. VAN BRUNT & HOWE, ARCHITECTS, BOSTON, MASS.

THIS building has been built for business purposes on first floor and basement, with offices on floors above. Its front is of brownstone from Longmeadow, Mass., and it is supplied with all the modern requirements of office-buildings, including marble staircase, hydraulic elevator, bells, tubes, electric light, etc. It is to a great extent a pioneer in this regard in Kansas City. It will cost, completed, about $60.000.

COMPETITIVE DESIGN FOR A $5,000-HOUSE, SUBMITTED BY "*Multum in Parco.*"

THE ESTIMATE.

Excavation,	$97.00	Windows,	$300.00
Stonework,	320.00	Blinds,	41.75
Brickwork,	345.00	Stairs,	23 .00
Concreting,	70.40	Inside finish,	790.00
Heating,	180.00	Mantels,	58.00
Plumbing (including drain-pipe and gas-fitting),	256 00	Plastering,	322.00
Cellar windows,	26.00	Painting,	350.00
Frame, covering and furring,	912.00	Roofing,	180.00
Trimmings,	295.00	Miscellaneous,	56.85
Outside wall finish,	170.00		$5,000.00

HOUSE OF LYMAN C. JOSEPHS, ESQ., NEWPORT, R. I. MR. C. S. LUCE, ARCHITECT, NEW YORK, N. Y.

HOUSE OF J. G. DARLINGTON, ESQ., HAVERFORD, PA. MR. R. G. KENNEDY, ARCHITECT, PHILADELPHIA, PA.

COMPETITIVE DESIGNS FOR A $5,000-HOUSE, SUBMITTED BY "*St. Lys*" and "*Ingomar.*"

AMERICAN ARCHITECT COMPETITION FOR HOUSE COSTING $5,000.—VI.[1]

"*ST. LYS.*"—Plan fairly good. Waste room in hall. Details good as far as they go. General mass and conception of exterior very good; symmetrical and simple. Lacks belt-course on line of second floors; also lacks sufficient projection to eaves. If gambrel could be of slightly less breadth, thus making it more nearly in scale with the gables, it would be better. Rendering lacks shadow.

"*Ingomar.*"—The plan under this title calls for the most severe condemnation possible. To deliberately invent awkwardly-shaped rooms when they are not required by the problem is a sure sign of absolute ignorance of good planning. Beside being expensive to build, awkward to furnish, such rooms are never satisfactory in appearance, and it is impossible to roof such a plan and make an exterior that will be good from all points of view. The first essential of good planning is to get symmetrical rooms opening *en suite*, and, as far as possible, this rule should be applied even to a small country house. Details: The ledge at top of stone underpinning would catch snow, which would melt and back into room. *Papier-maché* will hardly do for exterior use, even as a hinge or clamp where none is needed. Floor beams usually cut on to ledgers, and rafters on to plates. Boarding usually covers joint between stone underpinning and sill, where no water-table is used. Placing plate as shown on piazza posts would look very badly, and the plate is much too thin and would not support the rafters.

"*Two Dromios.*"—Plan ordinarily good. Waste space in hall. Details fairly good. Exterior: a very badly-proportioned gambrel. Proportion of bays to wall-surface, poor. Walls too high. Piazza cornice poor; square bay very poor indeed. Rendering needs study.

"*Dovercourt.*"—The study not well placed. Interior details very poor, especially staircase balusters. Exterior poor. Piazza posts too high. Bad method of finishing sides of hoods. Panels of rough-cast plastering are not ornamental. If plaster is used outside, it should be used in large surfaces, well proportioned, or not at all. Perhaps not at all would be the better advice at present. Rendering needs more free-hand work.

"*Sunset Lodge.*"—Waste room in hall; otherwise plan is very good. Novelist is isolated in an ingenious fashion. The whole design has a capital scheme of plan and of masses of exterior, with some few exceptions, but lacks skill in detail and in sense of proportion. The long veranda is very effective, but it is doubtful whether a gambrel should be put over it. The problem of terminating the lower slope of gambrel on east side at once comes up, and seems to necessitate throwing gambrel farther over to the west, or changing it to a pitched roof and getting head-room, where needed, by dormers. This latter method would probably be the better one. The dormers on rear would be better with pitched roofs. The lack of cornice and rake mouldings makes house seem uninteresting, and the rendering of the perspective, which is very poor, does not at all do the design justice. It has the making of an excellent house in it.

"*Lawn Tennis.*"—Library opens too near kitchen; otherwise plan is ordinarily good. Details are angular and stiff. Constructive details good. Design is not well proportioned; too little roof for wall; too slight projection to rakes. Looks boxy. Too many small panes of glass, diminishing the scale of windows that are already too small for the amount of wall-space. Rendering of details good; of perspective labored and spotty.

[1] Continued from page 74, No. 555.

PICTURES OF THE SEASON IN NEW YORK.[1]—VII.

TURNING now from the portraits to the landscapes in the current exhibition of the Society of American Artists at the Metropolitan Museum, we find them fewer in number than we might perhaps have expected, but by no means lacking in interest. The tendency of many of our younger men to give themselves up largely to reminiscences of foreign lands, even when working here at home, has never shown itself so strongly — for very obvious reasons — in their landscapes as in their work with the figure. And this year we seem to see a distinct advance toward entire independence. American subjects are more numerous than ever, and in many cases are interpreted with a sympathetic truth which a few years ago was the rarest of qualities. I mean that a few years ago, even when a landscape was American in name it was too often French or Dutch in aspect — that while the artist's corporeal eye had been resting upon some local scene, his mental eye had been remembering foreign scenes and the manner of their interpretation by foreign brushes. Doubtless he was quite unconscious of the fact, and desired nothing so much as to be absolutely true to the special task he had set himself. But habits of eye and hand are stubborn things; and we have much reason to be thankful that so many of our young graduates of European schools have now succeeded in learning how to make American landscape themes "artistic" on canvas and yet not make them un-American. A singularly attractive example of this power is to be found in the work of Mr. Tryon. When his name first appeared in our catalogues it was associated with pictures that were excellent in many ways, but, I think, distinctly transatlantic in flavor. They always had the precious quality we call sentiment, but this sentiment apparently did not find itself quite at home amid our local materials. But year after year he has devoted himself to the study of American landscape under many aspects, and to-day has grown into a painter than whom it would be hard to imagine one more wholly in sympathy with his subjects. His technical ability has steadily improved as well, and he has wholly worked out of a certain undue softness and lack of vitality and variety in texture which once characterized his results, without losing the tenderness and individuality of color which they always possessed. To say that he has sentiment means, of course, that his work is poetical as compared with that which aims merely at giving the bare outer truths of nature. And few more poetical landscapes of wholly and distinctly American aspect have been granted us than his "Moorlands — Dartmouth" in the present exhibition. It shows a broad stretch of flat but rugged land, most characteristically truthful and yet most artistic in composition. The moisture-laden atmosphere is admirably palpable and visible, and the somewhat low scale of color does not at all degenerate into monochromatic dulness. And it should be noted as a great

TOWER OF OLD CHURCH. WESTON FAVELL, ENG.
AFTER SKETCH BY THOS GARRATT AA SKETCH BOOK, LONDON

[1] Continued from page 43, No. 552.

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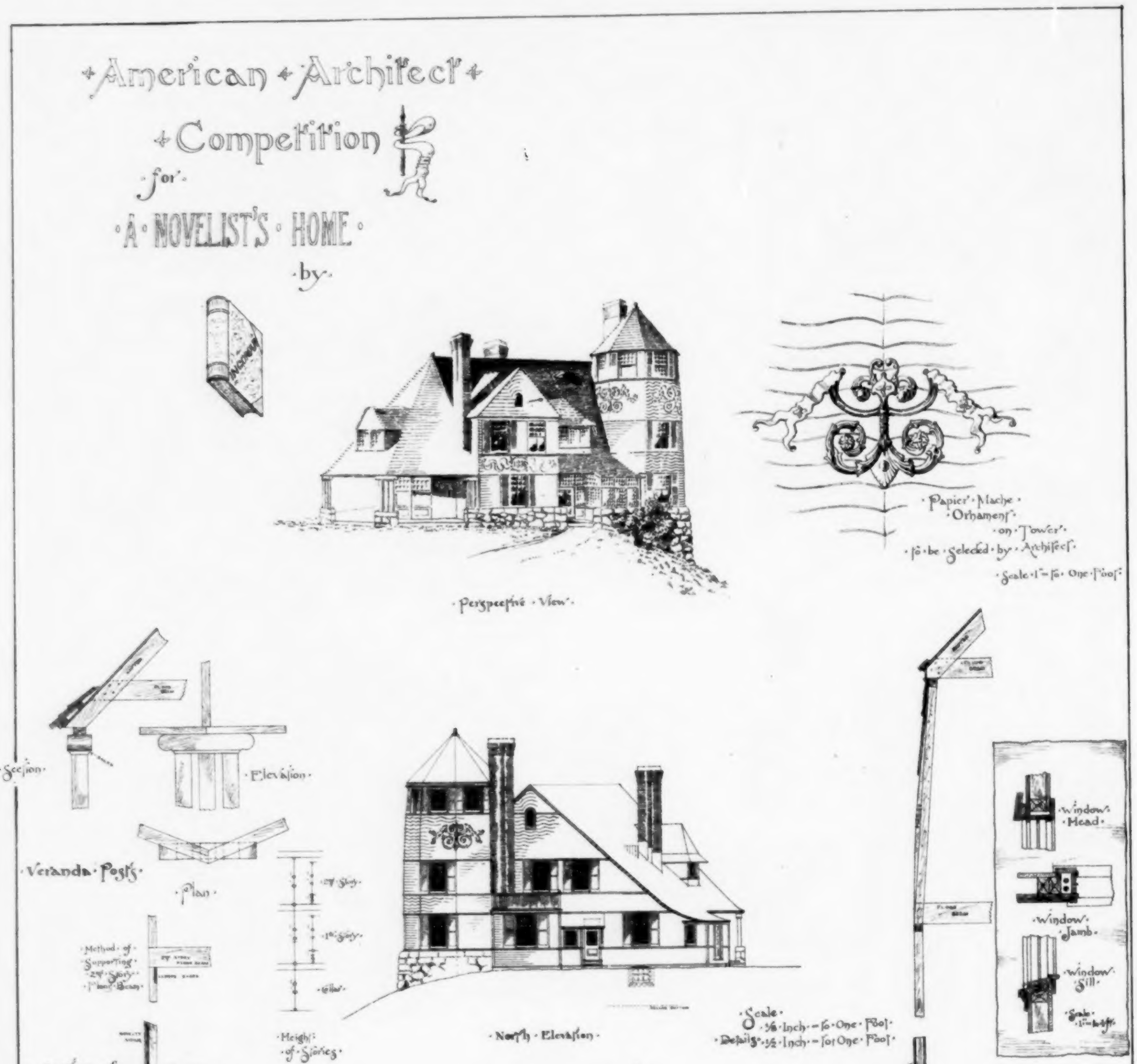

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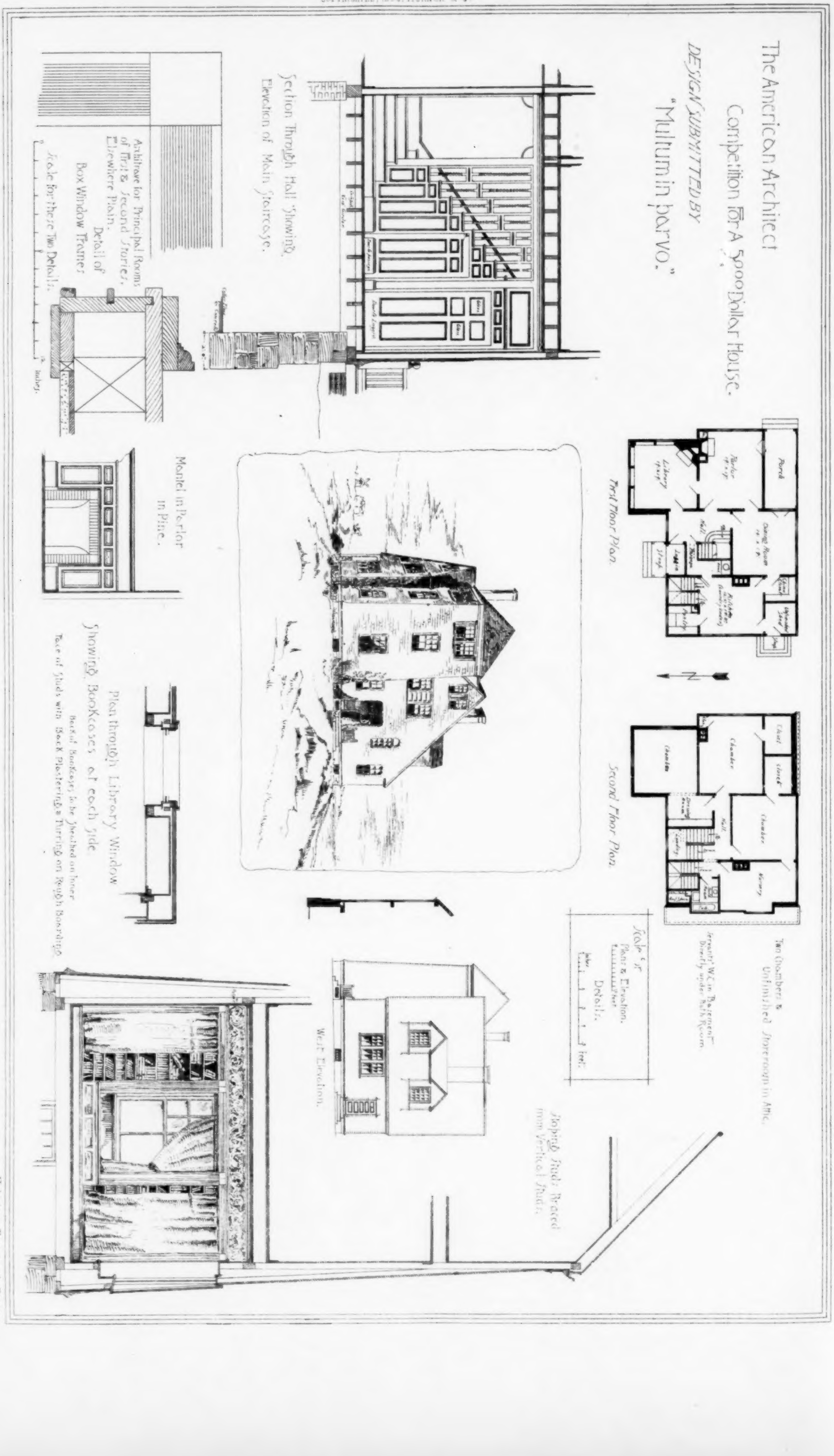

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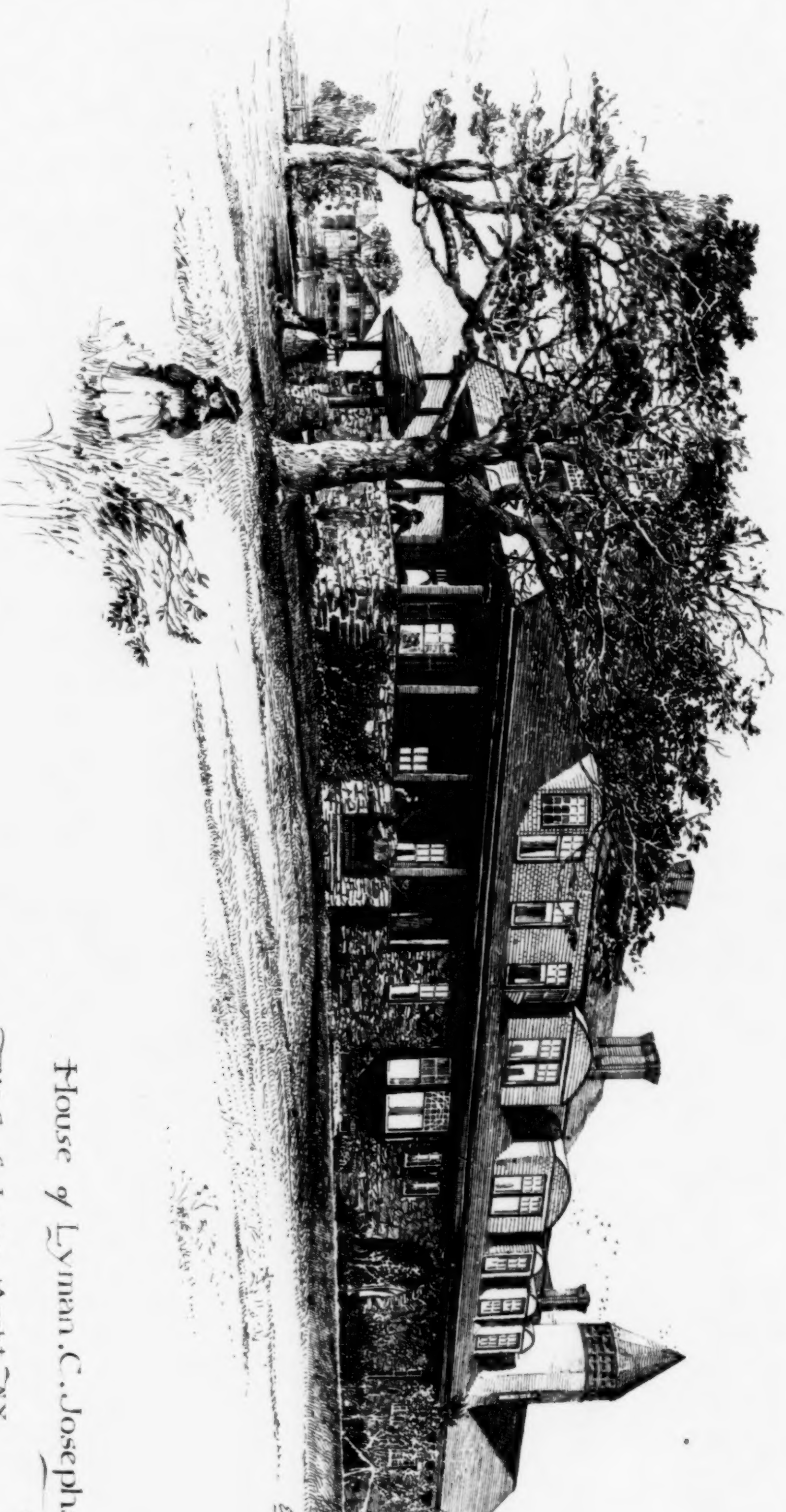

House of Lyman. C. Josephs. Esq.
Newport. R.I.
Mr C. S. Luce. Archt N.Y.

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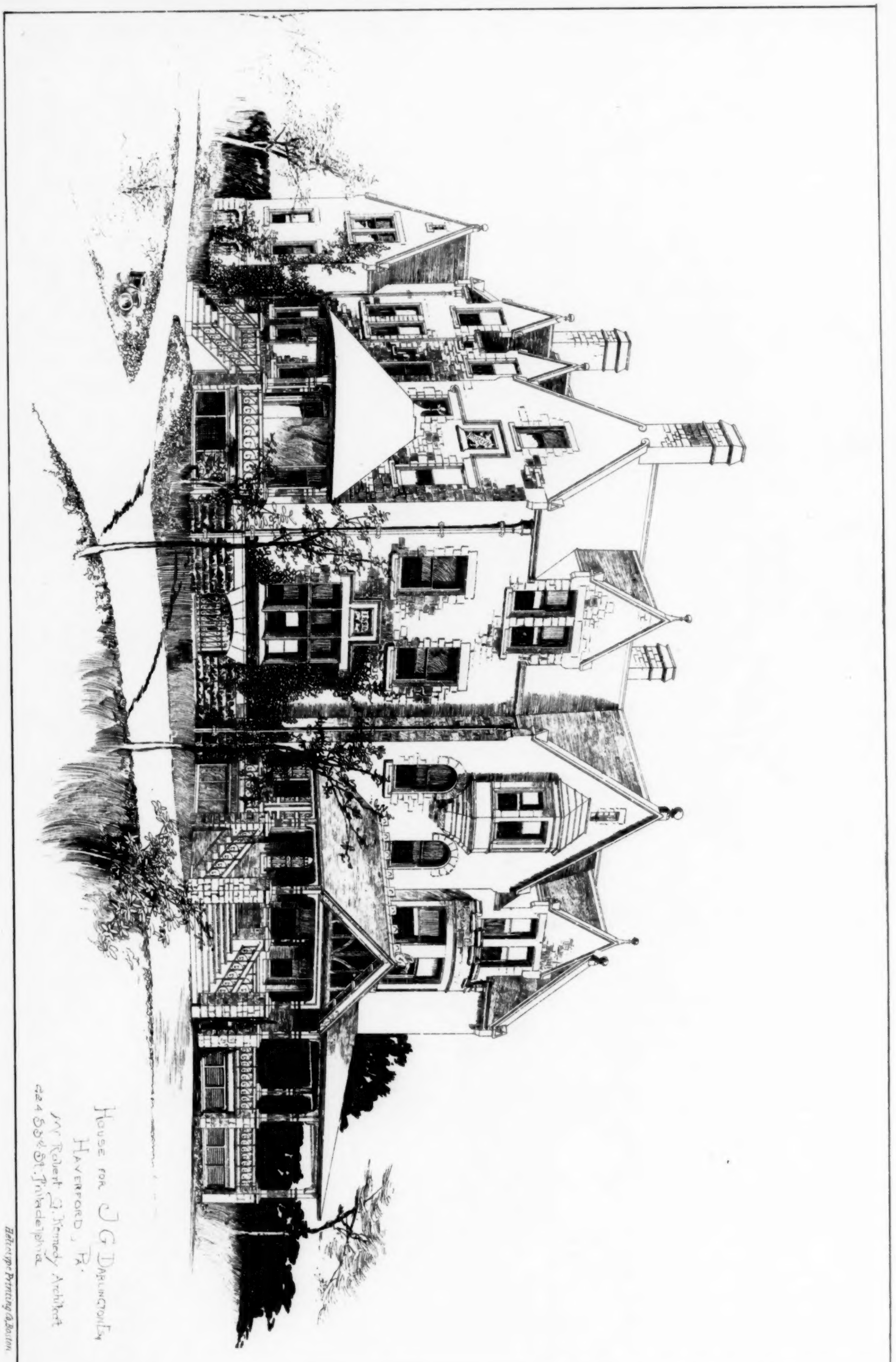

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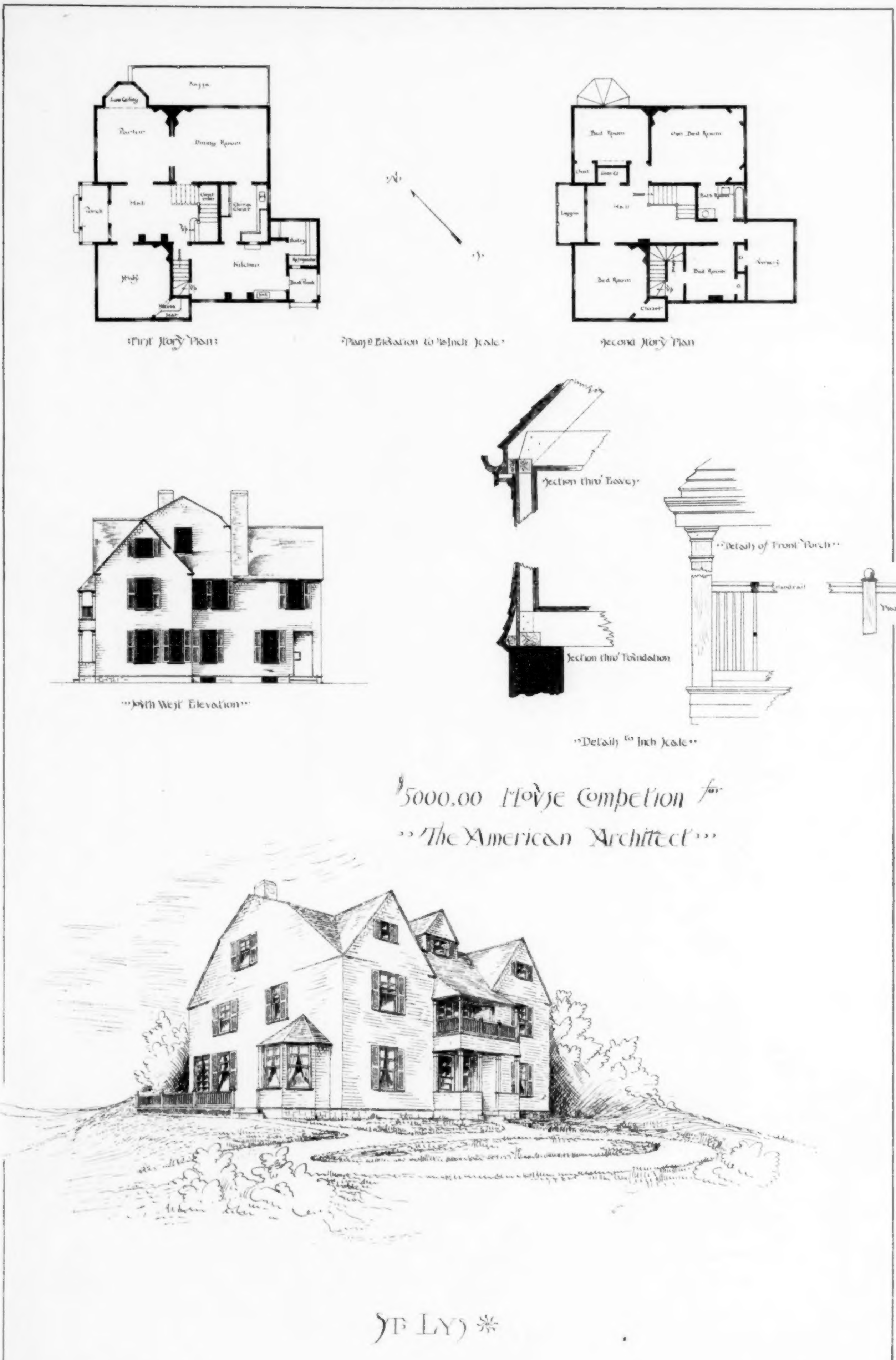

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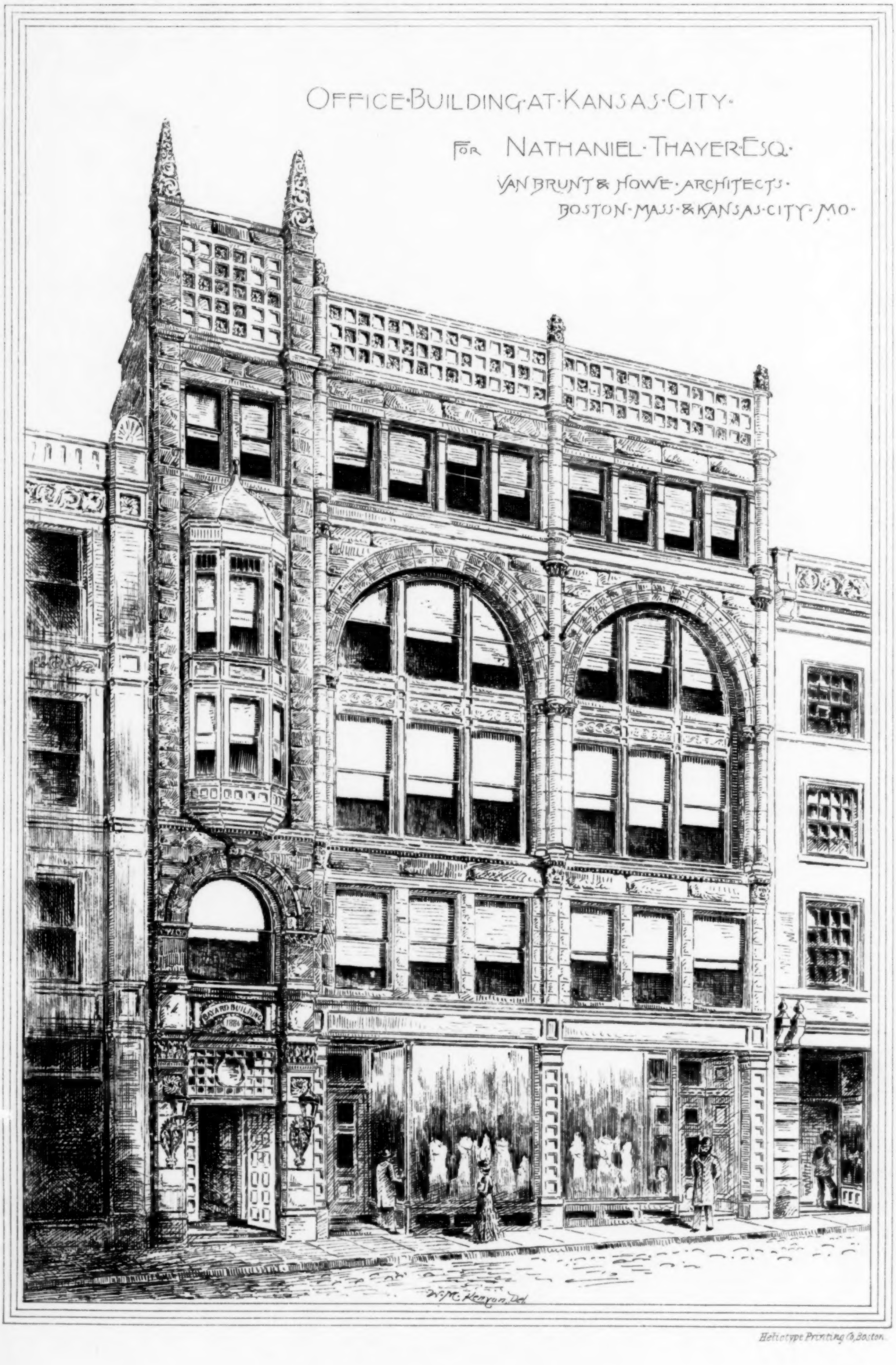


Heliotype Printing Co. Boston.

virtue that neither here nor in his other canvases, so far as I have seen them, does Mr. Tryon shirk the "Americanism" of his theme by omitting all evidence of the presence of man. Certainly our bare, square, little rural homes are not so attractive to the eye as the cottages of the old world; but nevertheless they are *here*, and if one essays to paint the land he must paint them, too, or confess to artistic cowardice. And, after all, they are by no means unpaintable, if a man has not an ordinary eye but the eye of a true artist. Certainly they are satisfactory enough under Mr. Tryon's touch. See, for example, his second picture in this exhibition — a very small moonlit canvas with a flock of sheep and a little bare farm-house on the top of the low hill-side up which they are straggling. It is the simplest bit of New England nature and life that one could well imagine, yet as poetical in this transcript as though it had been a bit of Barbizon itself. And if we examine it attentively we see that its charm springs largely from its very unlikeness to any foreign scene. The clear, dark, vital blue of the sky is very different from the moonlit skies of northern Europe, and the truly American fact that the little house is white, has given the artist the happiest of his details. It is a capital bit of work, and a charming idyl, too: he who cannot find poetic suggestiveness in this cool, clear, placid night, and in the single lighted window of the humble dwelling, is, I am afraid, neither a good judge of art nor a good citizen of the Great Republic. So often, by the way, is moonlight travestied upon canvas, so seldom is it painted, as here, without exaggeration and without shortcoming, that it is to be hoped this will not be by any means Mr. Tryon's last experiment in the same direction.

Mr. Ryder's "Moonlight," on the other hand, does not seem to me a piece of poetized truth so much as a piece of imagination pure and simple. As such it has—for it is Mr. Ryder's.—a distinct value of its own, though inferior, in my judgment, to very many of its forerunners. Mr. Walter Palmer's "River Shore" is interesting, and so are Mr. Evans's landscape, Mr. Charles Warren Eaton's "November and Twilight," Mr. Kenyon Cox's "Oat-field," Mr. Coffin's "Hayfield and Afternoon," and Mr. Alexander's large "impressionist" study of a rocky New England pasture. Mr. Rost's "Evening at Clifton, Staten Island," is individual and simple and shows a successful desire to deal with the greens of nature when they are very blue. Mr. Allen's "Berkshire Pastoral" addresses itself with good results, on the other hand, to the days when our foliage has lost its greens altogether and taken on the difficult harmonies of autumn. Among a number of good landscapes with foreign subject-matter I need only note, perhaps, some delightful studies by Miss Amanda Brewster and Mr. Hitchcock's "Garden of Dutch Bulbs." The latter is rather a union of two themes than a single homogeneous conception, for the delicately toned and handled leafy background "falls away" to a regrettable degree from the foreground. But each part is nice in itself and the foreground is especially interesting just at this moment by reason of its proof that the vivid and sharply contrasted tints of a great tulip-bed may be painted more harmoniously than in Gérôme's picture in the Morgan collection, and yet with as much truth to the facts of local color. Miss Brewster's studies deal with the thrice-familiar features of the level French country, yet have a distinct individuality of their own—a fact which speaks well for the vitality and value of her talent. They are very pale and delicate in tone yet full of color and of atmosphere; show much feeling for composition, even when the theme is of the very simplest; and have to my eye a most attractive and poetic flavor.

Among the figure-paintings proper the most striking are certainly those signed by Mr. Kenyon Cox. One, called "Evening," shows the life-size nude figure of a nymph who is stretching herself to sleep in the midst of a wooded landscape under a sunset sky. I suppose nymph is the accepted term in such a case though it hardly seems very representative here, in such different fashion from this are the average nymphs of current art conceived. For this is no bloodless abstraction, no classicizing nonentity, but a very handsome, very healthy, very superb specimen of femininity—one who would be characterized by the simple term woman better than by any other. To say this is in itself high praise, and it is higher still to add that although it is a strongly sensuous impression we first receive from the figure, it is not at all a sensual impression. If she is not an abstract nobody, neither is she simply an undressed model. There is very good color, it seems to me, in the flesh and the general scheme is strong and rich. The design of the landscape—with its broad, open foreground stretch and heavily-massed foliage in the background has a very desirable accent of dignity as well as charm, and the whole impression the picture gives speaks more of nobility, less of triviality or commonplace than is often the case in similar works. The drawing of the figure itself is in general very graceful and vigorous, though there is a lack of grace in the pose of the right arm which supports the reclining figure. With regard to correctness of drawing, I shall not venture to speak — for I have learned by long experience that this is a matter where, unless incorrectness is of a very patent sort or correctness proves itself beyond all question and all cavil, it is far safer and far juster for a layman to refrain from judgment. The artist who had his model before him, is much more likely to have reproduced correctly than we to imagine correctly: and in almost every case there is too much divergence in the verdicts of criticizing brother-artists for even their words to be taken as gospel. The only fault I shall venture to find with the work is with regard to a little matter of taste. It does not seem as though in Arcadia, when the only other draperies needed are soft airs and the sheltering mantle of light, a nymph would want an outstretched piece of white linen to lie upon. But its whiteness is certainly welcome and effective as an element in the general scheme of color. Unfortunately Mr. Cox's other and kindred essay called a "Vision of Moonrise" is by no means so satisfactory. It shows the same commendable love of pure sensuous beauty, and the landscape background has again much individuality and charm. But otherwise the composition — two figures and a vividly ruddy moon—falls very far short of the desired effect alike with the eye and with the mind.

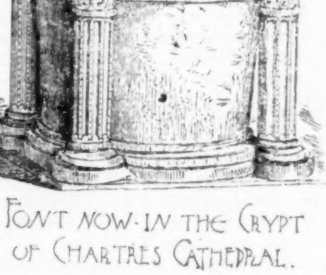
Mr. Francis Jones's "On the White Sand Dunes" shows a clump of low gnarled trees growing out of snowy sand with a glimpse of the sea beyond—a characteristically American, and also a very difficult theme which has been treated with great success and much beauty of effect. There is no imitation of foreign prototypes, yet almost any French painter of the *plein air* might be content to have done as well—to have been as true to his exacting local colors, yet to have kept his tonality so good, to have given so much truth of form and suggestion of detail and yet to have kept his effect so airy and and luminous and so deliciously fresh. The two girls' figures beneath the trees are well conceived and executed, but it is the landscape — or, more truly, the picture as a whole—which we like best to praise.

Mr. Brush adheres as ever (and very wisely), to his themes of Indian life. His "Before the Battle," showing a line of braves taking a last inspiration from the lips of a witch-like old woman, has good qualities of dramatic and other kinds, but, as painting proper, is somewhat hard, uninteresting and lacking in charm. Miss Chadwick's "Girl picking Water-Lilies" is simple and straight-forward, and seems to be commendably American in subject although its author dates, in the catalogue, from Paris.

In no exhibition could Mr. La Farge's work seem other than remarkable. Here we have a life-size water-color figure, called "The Lamp-Bearer," which is to be classed rather as decorative than as strictly representative art, yet is lovely and vital in type as well as mysteriously enchanting in color; and a number of exquisite little flower-studies among which a "Water-Lily in Sunlight" is perhaps the most inimitably delicious. In the exhibition itself it is pleasant to keep this for a *bonne-bouche* as we leave; but on paper I cannot venture to be so self-indulgent. I must add — though even thus I shall by no means make my report complete — that Mr. Theodore Robinson's "Bird's-nest" is a nice bit of French work and Mr. Steele's "Boatman" a good example of south-German; that Mr. Donoho's "Bicyclists in a French Village," is an attractive little sketch, and Mr. Robert Blum's "Dutch Interior," another good work of a kind we have had from him before; that Mr. Warner's portrait of Mr. Brownell—a study in plaster for a bust in bronze—has great vitality and great refinement, and, finally, that Mr. Francis Miller's "Juggler" is too vulgar to be passed over without a word of reprobation if we care at all for the well-being of our art. It is mournful indeed to see a painter—and especially one who has a clever hand—so mistake the canons of picture-making as well as those of universal good taste as to depict a young woman poising herself upon some acrobatic instrument, and poising another upon her nose. This, however, is the only example of distinct bad taste in the exhibition—the only one which shows the working of Parisian influence in its very worst shape. On the whole, the collection is extremely encouraging from whatever point of view we may regard it. "All good things," says a German proverb, "are in threes"—and the qualities of this collection prove the fact. For it shows, first, that our new men have attained to a greater mastery of color, as distinguished from tone, than they revealed in the beginning of their course; secondly, that they have become more American, alike in their choice of themes and in their manner of treating them; and thirdly, that they have grown to care more for meaning, feeling, sentiment, idea and less exclusively (which is not to say *less*, be it noted) for technical success.

M. G. VAN RENSSELAER.

PIPING FOR NATURAL GAS.



FONT NOW IN THE CRYPT OF CHARTRES CATHEDRAL.

THE fire-marshal of Pittsburgh, Pennsylvania, has, at the instance of the Board of Fire Underwriters, issued the following rules for gas-fitters, to be followed when laying-on natural gas:

"All pipes must be tested by the gas company's inspector with mercury column to ten pounds pressure, from end of line where connection is made to end of pipes under grates, stoves, etc.

"The fitter should have his pump on and see that the pipes are perfectly tight before sending for the inspector.

"The ends of pipes under grates, stoves, etc., should first be capped, so as to allow the stop-cocks to be tested; then remove the caps and see if the cocks allow the gas to leak.

"In case the mercury drops, a test for leak by putting ether in the pump, or with soap-water will be made.

"In no case shall a fire-test be used in dwellings, offices, stores, etc. No cement of any kind shall be used for repairing faulty fittings or work; nor is the use of blind gaskets permissible.

"When any attempt to hide leaks is made, the name of the fitter will be kept on record in this office, and future work done by him will not be approved without rigid examination.

"In running pipes in buildings no set rules can be given, except that pipes must, in all cases when possible, be so placed that they can be easily inspected; and that in case of accident any leaking gas may escape easily.

"Cement wall carefully where service-pipe enters the building, and use a large pipe for the main that runs through the cellar. Provide valves to shut off gas from all risers. In running pipes through flues great care is necessary, and lead pipe for the bends should not be used.

"Do not run between floors or walls when any other method can be employed. Do not place cocks between floors or ceilings. Do not use any valves which require packing at the stem in places where leaking gas may be dangerous. If pipes run outside of walls, provide a drip.

"Allow plenty of air under grates, so that the hearth-stone may not get too hot. Set the back tile in the grate so that the unburnt gases will be directed up the chimney, and not allowed to enter the room.

"By admitting more air under the grate, so that it will percolate through or between the hot bars in grate, results in a cheerful, bright fire from bottom of grate to the top of the fittings, and also in front.

"In fitting up a building, all gas-fitters will be required to furnish the gas company, who are to supply the fuel, with a statement giving the number of fires fitted up, and also any additional fires that may be connected afterward in the same building, so that a complete record may be had at this office. Blank forms for this purpose will be furnished by the different companies supplying natural gas.

"It should be borne in mind that a leak of natural gas is not so perceptible as of artificial gas, on account of the very slight odor arising from it; and more care should be taken in piping a building for its use.

"Fitters should also remember that accidents and explosions are likely to occur through defects in fittings and pipes; and as the introduction of natural gas is a benefit to the fitters, the community at large, and to the insurance companies, the fitters should do all in their power to make the use of natural gas as safe as possible; and they can materially aid in this by endeavoring to put in pipes and fittings in a perfect manner."

ON THE RELATIVE ECONOMY OF VENTILATION BY HEATED CHIMNEYS AND VENTILATION BY FANS. [1]

Of the various modes of producing the air currents by which vitiated air is removed from chambers, halls or working places, and fresh or pure air simultaneously introduced, involving the processes of ventilation, the heated chimney is the most common; although it is generally recognized that where large volumes of air are to be moved against considerable passive or frictional resistance, the use of the fan or blower is theoretically the most economical.

The following investigation has been undertaken with a view of establishing the exact theoretical relation between these two modes of ventilation, as far as economy of heat is concerned, and incidentally to determine, as far as the uncertain elements of the question may permit, the circumstances under which either of these methods may advantageously be employed in preference to the other; it being understood that the ventilation of public buildings, mines, suites of rooms, or single large rooms are all included in the problem.

It is assumed that since air is everywhere present at the earth's surface, ordinary ventilation is accomplished by a single movement of air, all portions of which exist under the same pressure before motion begins, and that therefore the problem does not involve the lifting of the air through a determined height. The resistance to motion, or the forces to be overcome, are then the frictional resistances of the passages through which the air flows, and the inertia of the air put in motion. The expression frictional resistances is to be understood as implying all those resistances which oppose or obstruct the motions of fluids through conduits or channels, and which are usually expressed in terms of the height due to the actual velocity of flow, or are proportional to the square of the actual velocity of flow.

The work per second necessary to overcome these resistances may be expressed by the weight which flows per second multiplied by the head or height of a column of fluid which, expressed in terms of the velocity of flow, represents the total resistances. The frictional head for a given condition of things — a given conduit and passages — is usually expressed by a constant depending on the length, form and dimensions of the conduit and passages, multiplied by the head due to the velocity of flow; or by an expression having the form

$$F\frac{v^2}{2g}.$$

The work performed in putting a weight of air represented by w in motion with a velocity v per second will be therefore

$$W = w\,\frac{v^2}{2g}\,(1+F).$$

If there are no resistances except those due to the inertia of the moving masses of air the constant quantity F disappears, and the work will be that represented by $w\,\frac{v^2}{2g}$ — the living force or actual energy imparted to the air per second.

In any investigation having for its object the relative economy of the methods of putting the same quantity of air in movement per second, through the same channels, and with the same velocity, it will be sufficient therefore to consider the work $w\,\frac{v^2}{2g}$, since the work performed per second in both cases must be the same whether the frictional resistances are considered or not.

It is further to be remarked, that by whatever means air is put in motion under the circumstances which we are considering, the process consists in a reduction of pressure at one point, whether a fan or a heated chimney be used, which creates an unbalanced head in the surrounding air, and a consequent flow to the point of reduced pressure.

This unbalanced pressure per square foot of section produced by a heated chimney is represented by the expression:

$$(1.)\qquad p = H.\,(D_a - D_c),$$

in which H represents the height of the chimney, D_a the weight per cubic foot of the external air, and D_c the weight per cubic foot of chimney air.

The height of a column of fluid, whether of chimney air, external air, water or mercury, which would represent this pressure is found by dividing the above value of p by the density of the fluid; thus,

$$(2.)\qquad \frac{P}{D_c} = H\left(\frac{D_a - D_c}{D_c}\right) = H\left(\frac{T_c - T_a}{T_a}\right), \text{ because } \frac{D_a}{D_c} = \frac{T_c}{T_a}.$$

T_c and T_a representing the absolute temperatures of the chimney air and the external air respectively.

In this last expression $H\left(\frac{T_c - T_a}{T_a}\right)$ represents the height of a column of air of a uniform density D_c, which by its weight would give a pressure per square foot represented by P.

The velocity with which air would flow into a space under this pressure is

$$(3.)\qquad v = \sqrt{2g\,H.\left(\frac{T_c - T_a}{T_a}\right)}.$$

The work per second produced by the chimney for each square foot of cross-section will be

$$(4.)\qquad W = pv = D_c\,v.\,H\left(\frac{T_c - T_a}{T_a}\right).$$

Substituting the value of v from (3) we have

$$(5.)\qquad W = D_c\sqrt{2g\,H^3.\left(\frac{T_c - T_a}{T_a}\right)^3}\quad . \;. \;. \quad \text{foot lbs.}$$

This is the work per second in foot-pounds accomplished by the expenditure of heat in heating the air of the chimney, and thus producing motion.

The quantity of heat thus expended is represented by the expression

$$(6.)\qquad Q = D_c\,v.\,c_p\,(T_c - T_a),$$

in which Q is expressed in units of heat, $\overline{D_c\,v}$ represents the weight of air which passes through each square foot of cross-section per second, and $(T_c - T_a)$ the number of degrees through which this air has been heated, and c_p the specific heat of air under constant pressure.

If we substitute again in this expression the value of v taken from (3) we have

$$(7.)\qquad Q = D_c\,c_p\sqrt{2g\,H\,\frac{(T_c - T_a)^3}{T_a}}.$$

This expression represents the heat units expended in heating the air of the chimney to produce the velocity v in the chimney.

The heat furnished may be supplied by a furnace at the base of the chimney, the heated products of combustion from which mingle with the air which enters the base of the chimney; by a system of steam-pipes which heat the air by contact as it passes through or among them, or by any other mode which will accomplish the result. If a fire or furnace be employed, as in mines, in such a way that the dissipation or loss of heat from the furnace is prevented, the efficiency of the furnace may be considered unity.

Under this, the most favorable circumstance for the efficiency of the chimney, equation (7) gives the total heat generated and available.

In ventilation by a fan or blower driven by a steam-engine, the heat expended to produce the same velocity, or the same discharge

[1] A paper by Prof. W. P. Trowbridge, read before the American Society of Mechanical Engineers, Chicago Meeting, May, 1886.

and renewal of air, will depend on the efficiency of the steam boiler and engine, the efficiency of the fan or blower, and the loss by friction in the apparatus.

If we consider the efficiency of the boiler and engine to be one-tenth, the efficiency of the fan five-tenths, and the loss from friction two-tenths, or the efficiency as regards friction eight-tenths, the resulting efficiency of the whole apparatus will be

$$E = .1 \times .5 \times .8 = .04 \text{ or } \tfrac{1}{25}$$

The work performed by the heated chimney to produce the velocity v, and for each square foot of cross-section was found to be equation (5)

$$\text{(8.)} \qquad W = D_c \sqrt{2g\, H^3 \left(\frac{T_c - T_a}{T_a}\right)^3} \quad . \; . \text{ in foot lbs.}$$

To produce the same work by a fan whose efficiency is $\frac{1}{25}$, twenty-five times this amount of work must be expended in equivalent heat units. Hence the number of heat units to be expended will be

$$\text{(9.)} \qquad Q^1 = \frac{25}{772} D_c \sqrt{2g\, H^3 \left(\frac{T_c - T_a}{T_a}\right)^3},$$

the second member being divided by 772 to transform its value in foot lbs., to its value in heat units. The relative quantities of heat expended by the chimney and fan, or the relative efficiency under the conditions assumed will then be

$$\text{(10.)} \qquad \frac{Q^1}{Q} = \frac{\frac{25}{772} D_c \sqrt{2g\, H^3 \left(\frac{T_c - T_a}{T_a}\right)^3}}{D_c\, c_p \sqrt{2g\, H.\ \frac{(T_c - T_a)^3}{T_a}}}.$$

$$\text{Or} \qquad \frac{Q^1}{Q} = \frac{25\, H}{772.\ c_p\, T_a} = \frac{H}{7.35\, T_a},$$

the value of c_p being 0.238.

If we suppose the temperature of the external air to be 60° Fahrenheit, the value of T_a will be 519.4, and

$$\text{(11.)} \qquad \frac{Q^1}{Q} = \frac{H}{3817.59}.$$

This expression shows that the relative efficiency depends only on the height of the chimney, and in no way on the differences of temperatures within and without the chimney. For a chimney one hundred feet high the efficiencies will be as 1 to 38.17; or,

$$Q^1 = \frac{Q}{38.17},$$

showing that the chimney requires an expenditure of heat thirty-eight times greater than the fan. For a chimney five hundred feet high, the fan will be 7.6 more efficient.

If the chimney be heated by steam-pipes at its base the efficiency of the boiler and pipes must be taken into consideration, making a result still more unfavorable for the chimney.

On the other hand, where small quantities of air are moved, requiring only a fraction of a horse-power, or one or two horse-powers, to drive a fan, these powers being produced by a small engine and boiler employed solely for this purpose, the efficiency of the mechanical apparatus would probably be much less than $\frac{1}{25}$, a condition of things unfavorable to the fan.

We may now inquire under what circumstances the chimney might be advantageously employed instead of the fan.

In all cases of moderate ventilation of rooms or buildings where as a condition of health or comfort the air must be heated before it enters the rooms, and spontaneous ventilation is produced by the passage of this heated air upwards through vertical flues, the efficiency of this mode of ventilation is evidently unity; that is to say, no special heat is required for ventilation; and *if such ventilation be sufficient*, the process is faultless as far as cost is concerned. This is a condition of things which may be realized in most dwelling-houses, and in many halls, school-rooms and public buildings, provided inlet and outlet flues of ample cross-section be provided, and the heated air be properly distributed.

If, starting from this condition of things, we suppose a more active ventilation to be demanded, but such as requires the smallest amount of power, the cost of this power, when the wages of a skilled mechanic are taken into account, may quite outweigh the advantages of the fan in fuel. There are many cases in which steam-pipes in the base of a chimney, requiring absolutely no care or attention, may be preferable to mechanical ventilation, on the ground of cost, and trouble of attendance, repairs and maintenance. There is quite a wide field for the employment of heated chimneys for ventilation before a limit is reached when the fan becomes indispensable, even when economy alone is considered; and this field becomes more extended, when convenience, saving of time, and personal care and attention influence a choice.

Ventilation by chimneys is disadvantageous under one point of view in any case, viz.: the difficulty of accelerating the ventilation at will when larger quantities of air are needed in emergencies.

The fan or blower possesses the advantage in this respect that by increasing the number of revolutions of the fan the head or pressure is increased, the law being that the total head produced is equal (in centrifugal fans) to twice the height due to the velocity of the extremities of the blades, or

$$H = \frac{v'^2}{g} \text{ approximately in practice.}$$

In mines it is evident that to produce by a chimney the same ventilation as that produced by a fan with the same economy of fuel the up-cast shaft must be very deep. Taking into consideration the wages of an engineer employed to run a large fan and the cost of maintenance and repairs, it might happen, however, that a mine of moderate depth, where the galleries are large and the resistances consequently small, could be efficiently ventilated by a furnace and chimney, at no greater expense than is required for the fan.

It is worth while to consider in this connection the rate at which the expenditure of heat increases in chimney ventilation when for the same channels of flow it is desirable to accelerate the velocity by increasing the heat of the chimney. Equation (3) gives the volume of flow per unit of section of the chimney, in terms of the height of the chimney, and the interior and exterior temperatures. For the same height H, the volume of flow per second is proportional to the square root of the difference of temperatures.

Equation (7) gives the expenditure of heat for the same height H, and for the same difference of temperatures. The height H remaining constant, the expenditure of heat is proportional to the square root of the cube of the difference of temperatures.

The first formula is equivalent to the following:

$$V = C \sqrt{T_c - T_a},$$

and the second to

$$Q = C' \sqrt{(T_c - T_a)^3}$$

C and C' being constants.

If in these formulas we make $(T_c - T_a)$ successively, 9, 16, 25, 36, 49, 64, 81, we have the following results:

Differences of Temperature.	Volumes.	Heat expended.	Differences of Temperature.	Volumes.	Heat expended.
9°	C × 3	C′ × 27	49°	C × 7	C′ × 343
16°	C × 4	C′ × 64	64°	C × 8	C′ × 512
25°	C × 5	C′ × 125	81°	C × 9	C′ × 729
36°	C × 6	C′ × 216			

This shows that as the volume (or velocity) is increased by increasing the difference of temperature, the expenditure or heat increases as the cubes of the volumes.

Economy of heat requires, therefore, that the *velocity* shall be kept small and increase of *volume* obtained by enlarging the chimney and the channels or conduits through which the air passes. Moreover, since the resistances from friction diminish in rapid proportion as the channels are enlarged, and more of the total head produced by the chimney becomes available to create the velocity of flow, an additional advantage in large cross-sections for the chimney and conduits is secured.

The same laws of expenditure of heat hold for the fan or blower, the expenditures of heat increasing for the same conduit as the cube of the velocity of flow. This is, in fact, a general law for all cases where work is performed under such circumstances that the resistances are proportional to the square of the velocity of motion. In such cases the resistance being ($R = C.\ V^2$) a constant multiplied by the square of the velocity, the work performed per second will be proportional to the cube of the velocity

$$W = Rv = C\, V^3.$$

It often happens that for a particular chimney and channels of flow the ventilation becomes insufficient, and instead of increasing the heat in the chimney with a large additional expenditure of fuel, a fan is introduced to take the place of the chimney ventilation. The relative efficiency $= Q \frac{Q^1 H}{3817.59}$, and the application of this law of the proportion of heat expended to the velocity of discharge enables us to ascertain to what limit such a substitution of a fan for a chimney may be carried before the cost of th: fan exceeds the cost of the furnace ventilation.

In the above equation of efficiency, if the chimney is one hundred feet high the fan will be thirty-eight times more efficient than the chimney, and the table shows that the velocity of flow by the fan may be quadrupled before the cost exceeds that of the chimney. If the chimney is two hundred feet high the fan will be nineteen times more efficient than the chimney, and the velocity of flow may be increased to a little more than two-and-a-half times that which was produced by the chimney before the cost by the fan exceeds that by the chimney. For a chimney five hundred feet high the velocity by a substituted fan could hardly be made twice that produced by the chimney before the cost of the fan with increased ventilation should exceed that of the chimney. The question might then turn upon the advisability of getting the increase by additional heat in the chimney even with a large proportional additional expenditure of fuel; the cost of attending and maintaining the fan becoming an important element in the problem.

It is quite evident that for the fan as well as for the chimney low velocities and large conduits are favorable to economy.

The following records of experiments are furnished in connection

with this paper as a contribution from Mr. George A. Suter, M.E., a graduate of the School of Mines, junior member of the Society, and now engineer for the New York Exhaust Ventilator Company.

RECORD OF EXPERIMENTS MADE WITH THE BLACKMAN FAN BY MR. GEO. A. SUTER, M. E., TO DETERMINE THE VOLUMES OF AIR DELIVERED UNDER VARIOUS CONDITIONS, AND THE POWER REQUIRED.

Revolutions per minute.	Cubic feet of air delivered per minute.	Horse-Power.	Water-gauge. Inches.	Nature of the experiments.
350	25797	0.65		Drawing air through 30 feet of 48 inch diameter pipe on inlet side of the fan.
440	32575	2.29		
534	41929	4.42		
612	47756	7.41		
340	20372	0.76		Forcing air through 30 feet of 48 inch diameter pipe on outlet side of the fan.
453	26660	1.99		
536	31649	3.86		
627	36543	6.47		
340	9983	1.12	0.28	Drawing air through 30 feet of 48 inch pipe on inlet side of the fan—the pipe being obstructed by a diaphragm of cheese-cloth.
430	13017	3.17	0 47	
534	17018	6.07	0.75	
570	18649	8.46	0.87	
330	8399	1.31	0.26	Forcing air through 30 ft of 48 in. pipe on outlet side of fan—the pipe being obstructed by a diaphragm of cheese-cloth.
437	10071	3.27	0.45	
516	11157	6.00	0.75	

The experiments were made by him with great care, the power of the engine driving the fan having been determined by the steam-engine indicator, and the volumes of air delivered having been carefully determined at the same time by an anemometer.

The fan employed was a Blackman fan, belonging to the class of disc fans, four feet diameter, and the experimental apparatus was so arranged that the air was drawn and forced alternately through a metallic tube thirty feet long and four feet diameter; the fan being mounted at one end of the tube.

In the first two sets of experiments the only resistance to the flow of the air was the frictional resistance of the tube and fan passages, and the resistance caused by the contracted vein at the entrance. In the second two sets the passage of the air was obstructed by a diaphragm of cheese-cloth placed within the tube; and this additional resistance was ascertained by a water-gauge in the usual way. The table of experiments is useful for determining the horse-power required for given volumes of air discharged with this class of fans, under free delivery and against resistances represented by the water-gauge readings of the table. For large volumes with free delivery, or with very small water-gauges, the efficiency and the small power required are worthy of attention. Estimating four and a-half pounds of coal per horse-power per hour in common cases, with coal at five dollars per ton, a horse-power will cost, as far as fuel is concerned, about one cent per hour; the hire of a man to take care of and manage the apparatus, including other expenses, perhaps twenty-five cents per hour.

For such cases, and especially where the power required is only a *small fraction* of a horse-power as in ventilating single large rooms, or small buildings, it is evident that as regards cost of fuel and the care and attention required, ventilation by heated chimneys is to be preferred. Where a fan is driven by machinery employed for other purposes than ventilation, the cost of attendance chargeable to ventilation being therefore trifling, the fan would evidently in all such cases be more appropriate. A variety of circumstances and conditions enter into these problems of ventilating single rooms, or halls, and a choice can only be made through the exercise of the best judgment.

Under circumstances where hospitals or public buildings of considerable magnitude are to be ventilated, and especially where the activity of the ventilation must be varied occasionally, the fan is, no doubt to be preferred. And this is quite sure to be the case when the vitiated air is drawn through several systems of collecting ducts from a series of large rooms, into one main outlet; the friction of such collecting conduits, and the resistances of bends and changes of direction in them becoming principal factors in the power consumed.

In such cases a comparatively high velocity at the outlet is indispensable. A system of ventilation by means of heated chimneys in such cases involving no greater cost would require numerous and ample vertical heated flues so arranged in the construction of the building that the velocity in each flue should be the smallest possible, and the frictional resistances avoided by the most direct passages of the vitiated air to the heated chimneys. A thorough and proper distribution of the incoming fresh air would demand such a distribution also that collecting ducts could be largely dispensed with; or if they were necessary, that they should be as short and as large in size as the conditions of least resistance might demand.

Such a system might, in many cases, be preferable to one involving the use of a fan even in large buildings; but unless such buildings have been designed with this plan in view, proper inlets for fresh air forming a part of the plan, it is difficult to apply it with success.

In nearly all public buildings of large size, which come under the head of old buildings in which the necessities of proper ventilation were originally neglected, the fan will probably be found to be the most efficient remedy for deficient ventilation.

ROOFING-SLATE IN INDIA.

UNITED STATES CONSULATE, SINGAPORE, March 8, 1886.

I AM informed that the manufacturers of black roofing slate in the United States are desirous to obtain information respecting the uses of that article in India; that the slate area in the State of Pennsylvania was almost inexhaustible and as rapidly developed as the demand increased; that the manufacturers were desirous of extending their exportations to India; that large quantities had been shipped to Australia and other distant countries.

Last year I answered Messrs. Boyle & Co., slate-exporting financiers, of Philadelphia, anxious to extend their trade hereabouts, after recommending to them the appointment of an agency, to send to the same a trial consignment (which holds good to-day), as follows:

Thus far little slate for roofing has been used, tiles being generally used throughout India; and for cheap light buildings (bungalows) the leaf of the attap palm (thatch) It would be best to forward and consign a sufficient quantity for trial and introduction I feel morally certain that without doing this you will not get orders What slate has been used here for roofing (on Government buildings chiefly), was imported from England, and you are better able to judge as to whether you can compete with that country. The cost of freight on a sailing vessel would be about the same from Philadelphia as from an English port. I think.

Being directed to report upon all India, I must confess that, while I am pretty well informed about that vast country and islands belonging thereto (British and Dutch), I have never yet been in Upper India; but there are many here who have been there, and they tell me that for roofing houses about the same materials are used as in this colony, as follows:

MANNER OF ROOFING.

1. For all substantial buildings (governmental, mercantile, and residential), the *half-round tile* (made of brick clay and baked) is used. These are easily laid (joining in and out, under and over, and overlapping each other), and makes an excellent, durable, as well as cool roof in a tropical country, as they furnish air currents throughout (in a cold climate, unless covered with water or cement where they lap and join, they would not answer). A tile roof is, of course, very heavy, but as there is an abundance of very hard wood out of which to make timbers and frames able to bear it, it does not matter. Cooly labor is very cheap (ranging for all India from eight to twenty cents per day), clay and fuel abundant, and as a rule very near each other, and therefore tiles can be had cheap.

2. For plantation and cheap European residences, bungalows, and the dwellings of the native population in suburban and country districts and on farms, all having, as a rule, far-projecting roofs, the leaves of the attap-palm, the kadjang (a species of huge grass growing on low, marshy river-bottoms, shallow lakes, and lagoons in vast fields, as I have seen in the swamps of Kassang River, near Malacca),[1] and sundry other tough broad grasses and fibres suitable for thatching, are used and give general satisfaction, being very abundant, cheap, and answering their purpose well. A well-made attap or kadjang roof will last from three to four years, when it becomes brittle and as a consequence leaky, and must be removed.

3. For the roofs of coal sheds, wharves, warehouses, landings, bazaars and markets, verandas, and other airy, light shed-like structures, having no walls and only posts or brick pillars for support, corrugated sheet-iron or fluted zinc sheets, this, with steadily increasing tendency is used. This kind of roofing was first introduced here about twelve years ago.

NO PRESENT MARKET FOR SLATE.

As to *black slate* for roofing, it has been used, to my knowledge, on two new Government buildings having mansard roofs within the last two years, *i. e.*, police headquarters and post-office, one mercantile building, and two churches. This slate, as none has ever been kept for sale here, was imported from Wales, where, there being large quarries of it, I am told it is very cheap.

Firms in the United States engaged in the manufacture and export of slate can easily find out whether they can successfully compete with English quarries in Eastern markets, the cost of freight being about the same from our Atlantic as from ports in England (on sailing vessels, I mean).

Summed up, upon careful consideration and reflection (referring more to my consular district than all India), I hardly think that the sale of slate for roofing, from *any* country, will ever amount to much in the tropical part of Asia. But as some will be used, perhaps more and more as civilization, with a higher taste for architecture advances, it would, I think, be well for our American slate exporters to create agencies in the principal ports of India, and to forward to them trial consignments (not too small) of their productions. I know of no better way, if they can only compete with English or European exporters. It must be borne in mind at the same time that Calcutta, and perhaps Bombay excepted, we have no American firms in British or Netherlands India, and *must* rely on foreign merchants for the sale of any kind of American merchandise.

[1] I have read in some naturalist's books that the kadjang is a palm-leaf, which is *absolutely* not the case. It grows about as tall as an average corn-stalk out of water; its leaves resemble, in shape and length and breadth, a corn-leaf, but have a saw-like jagged edge. The stem of the kadjang is about as thick as a corn-stalk, and as *readily cut*.

I would recommend the creation of agencies at the following ports: Calcutta, Rangoon, Madras, Bombay, Colombo (Ceylon), Singapore, and Penang, Bangkok (Siam); Batavia, Sourabaya, and Samarang, in Java, and Manilla (Philippine Islands).

A. G. STUDER, *Consul.*

THE FREEZING PROCESS AS APPLIED TO QUICK-SAND FOUNDATIONS.[1]

DOOR HANDLE. WHALLEY CH. LANCASHIRE. ENG.

A RATHER remarkable application of refrigeration was made towards the close of last year by Captain Lindmark, of the Swedish Royal Engineers, who was engaged in the construction of a tunnel for foot-passengers through a hill in Stockholm, on the top of which were built residential houses. The workmen came upon some ground, consisting of gravel mixed with clay and water, which had so little cohesion that the ordinary method of excavation had to be abandoned and the works stopped, owing to a subsidence in the earth above, which endangered the safety of the houses. Underpinning was out of the question, on account of the great expense. Under these circumstances it was decided to freeze the running ground, and to use cold air for the purpose as being most readily applied. One of the author's horizontal machines, capable of delivering 25,000 cubic feet of air per hour was accordingly supplied by Messrs. Siebe, Gorman & Co., and was erected in the tunnel as close as possible to the required spot. The innermost end of the tunnel next the face was formed into a freezing-chamber by means of partition walls, which were made of a double layer of wood filled-in between with charcoal. In the middle of last September the works were resumed. After the refrigerator had run for 60 hours continuously, the gravel was frozen into a hard mass to a depth varying from five feet near the bottom of the tunnel to one foot near the top. At the crown no freezing took place; and though the temperature at the bottom of the chamber was as low as 40° Fahrenheit below zero, a thermometer placed at the top, 16 feet above the floor, indicated 32° above zero. This circumstance however was an advantage rather than otherwise, because in any case the roof would have had to be supported by planking, which would have been difficult to drive into the gravel had it been actually frozen at that part. The work was proceeded with in lengths of five feet, the excavation commencing at the top; and a temporary iron wall, made up of plates 12 inches square, was built in against the face from the top downwards as the cutting away of the gravel proceeded. For 8 feet to 10 feet up from the bottom no protection was needed, as the frozen gravel formed such a hard solid mass that it had to be removed with special tools. After once fairly starting, it was sufficient to run the cold-air machine on the average from 10 to 12 hours every night, excepting after heavy rains, when much water percolated through the gravel. The machine worked all the time without a single hitch, and delivered the air at a temperature of 67° Fahrenheit below zero. The temperature of the freezing chamber was generally from 6° to 15° Fahrenheit below zero after 12 hours' running; but it soon rose to freezing point when the men began to work. After two five-foot lengths had been excavated, the partition-wall was moved forward; the capacity of the freezing-chamber varied thus from 3,000 to 6,000 cubic feet. The arching of the tunnel was completed as rapidly as possible close up to the temporary iron wall, while the ground was still frozen. This method of driving the tunnel was employed through a distance of about 80 feet, with entire success. In the residential house to the north, neither subsidence nor cracks were perceptible three months after the tunnel was completed at this point. In the house to the south, the front has subsided about an inch, causing some small cracks in the walls; but this house was not so well built as the other, subsidences having taken place in it before the tunnel was commenced. The daily progress while using the freezing process averaged about one foot.[2]

Although this is the first instance in which a dry-air refrigerator has been applied for the freezing of running ground, it is not the first in which refrigeration has been used for that purpose. As early as 1862 an ether machine was constructed by Messrs. Siebe, Gorman & Co., for freezing a quicksand met with in sinking a well. In that case pipes formed into a coil of larger diameter than the lining of the well were sunk into the quicksand, which was then frozen solid by circulating cold brine through the pipes. The excavation was then proceeded with, the lining put in, the circulation of brine stopped, and the coil removed. The same plan has recently been adopted by Mr. Poetsch, in Germany, in connection with the sinking of colliery shafts; but instead of a coil a series of vertical iron-pipes are used, arranged in a circle, the effect of course being precisely the same.[3] For driving the Stockholm tunnel, however, it is difficult to see how freezing by means of brine could have been applied, the excavation being horizontal instead of vertical.

[1] From a paper by Mr. T. B. Lightfoot read before the Institution of Mechanical Engineers, and printed in *Engineering.*

[2] A full description of the construction of this tunnel is given in *The Engineer* of April 9, 1886, page 282.

[3] Further particulars of Poetsch's process are given in *The Engineer* of November 30, 1883, page 417.

TABLE I.

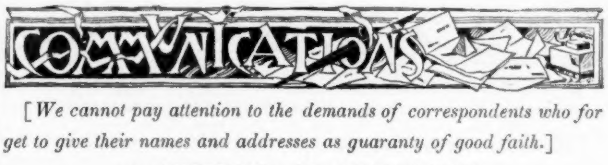
FREEZING MIXTURES.

Composition by Weight.		Reduction of Temperature in Degrees Fahr. deg. deg. deg.
Ammonium nitrate	1 part	From + 50 to + 4 = 46
Water	1 "	
Ammonium chloride	5 parts	From + 50 to + 10 = 40
Potassium nitrate	5 "	
Water	16 "	
Ammonium chloride	5 "	From + 50 to + 4 = 46
Potassium nitrate	5 "	
Sodium sulphate	8 "	
Water	16 "	
Sodium nitrate	3 "	From + 50 to − 3 = 53
Nitric acid diluted	2 "	
Ammonium nitrate	1 "	From + 50 to − 7 = 57
Sodium carbonate	1 "	
Water	1 "	
Sodium phosphate	9 "	From + 50 to − 12 = 62
Nitric acid diluted	4 "	
Sodium sulphate	8 "	From + 50 to − 0 = 50
Hydrochloric acid	9 "	
Sodium sulphate	5 "	From + 50 to + 3 = 47
Sulphuric acid diluted	4 "	
Sodium sulphate	6 "	From + 50 to − 10 = 60
Ammonium chloride	4 "	
Potassium nitrate	2 "	
Nitric acid diluted	4 "	
Sodium sulphate	6 "	From + 50 to − 40 = 90
Ammonium nitrate	5 "	
Nitric acid diluted	4 "	
Snow or pounded ice	2 "	To − 5
Sodium chloride	1 "	
Snow or pounded ice	5 "	To − 12
Sodium chloride	2 "	
Ammonium chloride	1 "	
Snow or pounded ice	24 "	To − 18
Sodium chloride	10 "	
Ammonium chloride	5 "	
Potassium nitrate	5 "	
Snow or pounded ice	12 "	To − 25
Sodium chloride	5 "	
Ammonium nitrate	5 "	
Snow	3 "	From + 32 to − 23 = 55
Sulphuric acid diluted	2 "	
Snow	8 "	From + 32 to − 27 = 59
Hydrochloric acid	5 "	
Snow	7 "	From + 32 to − 30 = 62
Nitric acid diluted	4 "	
Snow	4 "	From + 32 to − 40 = 72
Calcium chloride	5 "	
Snow	2 "	From + 32 to − 50 = 82
Calcium chloride crystallized	3 "	
Snow	3 "	From + 32 to − 51 = 83
Potash	4 "	

TABLE II.

EVAPORATION OF LIQUIDS.

Liquid or Gas.		Water.	Anhydrous ammonia.	Sulphuric ether.	Methylic ether.	Sulphur dioxide.	Pictet's liquid.
Specific gravity of vapor, compared with air = 1.000		0.622	0.59	2.24	1.61	2.24	
Boiling point at atmospheric pressure, deg. Fahr.		212	−37.3	96	−10.5	14	−2.2
Latent heat of vaporization at atmospheric pressure, units.		966	900	165	..	182	
Absolute vapor tensions in pounds per square inch at different temperatures.	deg. Fahr.	lb.	lb.	lb.	lb.	lb	lb.
	−40						
	−20	..	19.4	..	12.0	5.7	11.6
	0	..	30.0	1.5	18.7	9.8	15.4
	+20	..	47.7	2.6	28.1	16.9	22.0
	+32	0.089	61.5	3.6	36.0	22.7	27.0
	+40	0.122	73.0	4.5	42.5	27.3	31.3
	+60	0.254	108.0	7.2	61.0	41.4	44.0
	+80	0.503	152.4	10.9	86.1	60.2	60.0
	100	0.942	210.6	16.2	118.0	84.5	79.1
	120	1.685	283,7	23.5	..	117.5	99.7
	140	2.879	..	33.5			
	160	4.731	..	45.6			
	180	7.511	..	62.0			
	200	11.526	..	81.8			
	212	14.7	..	96.0			



[*We cannot pay attention to the demands of correspondents who forget to give their names and addresses as guaranty of good faith.*]

A QUESTION OF COMMISSION.

MILFORD, MASS., Aug. 14, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,— What would be a proper charge to make for services on drawings under the following circumstances: A corporation appoint a committee to build a building. The committee go to the office of an architect of good reputation and employ him to make

sketches and estimates — first, an approximate estimate, second, a definite estimate as to the entire cost of building, together with further sketches introducing changes which they desire. They then decide to build, and go to the architect and make a verbal agreement for plans and specifications at two and one-half per cent. The architect commences work, and has the working-drawings partially laid out, when he is notified to stop until said committee can decide on a change they wish to make, which they say will be completed in a few days. They fully understand that the architect has taken this work with the understanding that it must be completed within three weeks, ready for estimates. Two weeks pass; no instructions received, the architect writes to committee, but receives no answer. Finally, four weeks after, they send him a letter and say they have decided to use another architect's plans. All this time the architect has held himself in readiness to complete this work, and has suffered by delay of committee, who knew they were to employ another architect, simply to please one man of said committee, and had decided to do so three weeks before they notified the architect of the fact. The cost of building was estimated at $11,000. Now, what would be the charges under these conditions? Please answer in your next issue, and oblige Respectfully yours, Fred Swasey.

[We trust our correspondent will be able to give this building-committee a lesson — in economy, at least, for we suppose that they do not imagine that in addition to the payment they must make to the architect they are now employing, they must pay our correspondent for the services he has rendered before his summary supersession as follows: One per cent for his preliminary sketches; one-half of one per cent for his "definite estimate," and the alterations in his original sketches which were made at the request of the committee, and a fair *per diem* for the time spent on the working-drawings. If the specifications were written, which does not appear, we should say our correspondent was entitled to nearly two per cent on the estimated cost.— Eds. American Architect.]

THE CAPITOL TERRACE.

Brookline, Mass., August 17, 1886.

To the Editors of the American Architect: —

Dear Sirs,—You express regret that in my note to you of last week nothing was said of the feasibility of lighting some of the rooms from the outside, and observe that "if the real economical and practical value of the new [outer] rooms is their capacity as storage-rooms for rarely-visited archives, the matter of external light is of no consequence, and the designing of the terrace is architecturally correct."

In the observations that led to my note, a doubting view had appeared as to certain points of fact, and my purpose in writing was simply to state reassuring circumstances. As to the purposes for which the rooms in question are needed, it is a matter of opinion. The weight of opinion is strongly in the direction that you suggest. The plan has been under discussion twelve years, and until this year it has not, to my knowledge, been thought desirable by any member of Congress, or any one interested, that the rooms should be prepared with reference to any other use than storage. The first suggestion of windows in the outer wall was made by a member of the House, who gave no reason for thinking them desirable except that the terrace would be more ornamental if round openings, with suitable decorative borders, were introduced in the blank spaces between the piers. Afterwards the proposition was urged by others on grounds of utility. The question thus coming up, the proper committees of the House and the Senate were both of the opinion that the rooms would be required only for storage, and both Houses afterwards acted on this view, voting that the work should go on without change of plan in that respect. Yours respectfully,

F. L. O.

THE ALLEGHENY CEMETERY COMPETITION.

Galveston, Texas, Aug. 12, 1886.

To the Editors of the American Architect: —

Dear Sirs,— Would you be kind enough to let me know what set of plans were adopted by the Allegheny Cemetery Managers, and, if possible, would like to see them published in your paper. The plans referred to were advertised for up to the 1st of July.

Respectfully, B. G. Chisholm.

[Perhaps the successful competitor will himself reveal his name.— Eds. American Architect.]

NOTES AND CLIPPINGS

A New use for Italian Mosaics.— The curious suggestion has been made by Mr. Francis Galton, of the London Anthropological Institute, that some of the colors of the Italian Mosaic-workers be employed as standards for describing the tints of the skin of the various races and tribes of mankind. These colors have great durability, mosaics in St. Peter's at Rome having shown no signs of change after more than a century. A great variety of tints is available, there being about five hundred appropriate to the flesh of European nations alone.— *Exchange.*

Carthaginian Mosaics. — Not long ago some highly artistic relics of ancient Carthage were disposed of at an auction in London. Two of the finest of these are mosaics, in splendid preservation, each about three feet square. The one represents a woman robed and wearing a crown of flowers, with a naked youth sitting beside her; and the other, a youth carrying on his shoulders an eagle. These have been called "Peace" and "War," but there seems to be no authority for this. Both works are evidently early Carthaginian, and must have belonged to a period when Carthage held a high position as a nursery of art, especially in the beautiful art of mosaic work, of which ancient Greece has left no trace, while the mosaics of Rome are of a much later date. It will be remembered that Carthage was celebrated for her beautiful colored marbles, and for the wonderful skill of her artists and workmen, which were known throughout the civilized world, for Carthage was a large city 140 years before the foundations of Rome were laid. It is possible, therefore, that the peculiar art of working in mosaic may have been originated in Carthage, and may have found its way to Rome, where it might have been practised by Roman, or even Carthaginian artists. But, as a rule, the Roman work is very inferior to the Carthaginian.— *Chambers' Journal.*

TRADE SURVEYS

The widely published railway statistics, iron-trade statistics, and building statistics all point in the direction of improving industrial and commercial activity. That which most interests the thoughtful business man is, when will the present impulse stop? — for a stop is generally anticipated. A reaction, something like that of 1873 to 1878, is expected by the shallow observer of trade tendencies. Bankers, railroad-managers, and the controllers of immense industrial undertakings, are not acting as though they anticipated any early reaction. Railway statistics are of a favorable character. Share capital has increased only slightly, and the funded debt is but little greater. Earnings are practically the same for two years. Net earnings three and one-half per cent. Earnings per mile decreased from $6,663 in 1884 to $6,265 in 1885. Tonnage was ten per cent greater. The current year is more favorable to traffic and earnings and railroad companies are making more purchases than last year. The iron and steel statistics are equally encouraging. Weekly pig-iron production has increased over twenty-five per cent in six months, viz., from 97,000 tons per week to 122,000 tons per week, with production expanding and prices firm. The railmakers at Long Branch said they could meet all demands this year, and would turn out 14,500,000 tons, rails enough to lay over 15,000 miles of road. Building interests are also prosperous. Within two weeks large contracts have been placed, especially in the States west of Pennsylvania, for architectural iron, lumber, stone, brick, and general building material. Bricks and lumber have been especially active. For the former, prices declined just enough to draw out a large waiting demand. Heavy contracts have just been placed for delivery of lumber in the West and Northwest. Contracts have also been recently placed for 2,000 freight-cars, and the builders of passenger and palace cars are oversold for three months. While these evidences are encouraging it is well to note a few possibilities on the other side. Investors of capital have been complaining more and more of the uncertainties surrounding the earning capacity of money. Production is making headway against capital, and is gradually becoming more and more independent of it. Last year $267,000,000, in round numbers, was paid as interest and dividends on nearly $8,000,000,000. This ratio of taxation must decrease in the nature of things. The preparatory steps are being taken in a better industrial and manufacturing organization. The same tendency is observable in other directions. In short, profit on invested capital must gradually decrease under the increasing surplus of wealth and the increasing productive capacity. Financiers are beginning to admit what they have long faintly recognized, and are considering how to adjust their interests in the greatest harmony with the new order. The effect of this decrease in cost for money will be as it has been to increase industrial and building activity, and, in short, to work to the interests of the producing millions. It is quite natural to see an anxiety among the industrial interests to promote shipping activity. Another movement has been made by a body calling itself the American Shipping and Industrial League, and which has issued an address to the United Industries of America. This may, and probably does, emanate from an irresponsible body, but it indicates that there is need of just such action. The industrial interests have long recognized that a healthful shipping was necessary. The proposed action of the government in expending several million dollars in the construction of war ships will open the way. The urgency for special machinery continues. Cast and wrought pipe orders are in excess of mill capacity. The money-markets are not so easy as a month ago. Rates are growing stronger in nearly all cities west of the Mississippi. Surplus reserves are decreasing, and government accumulations are increasing. There is an abundant supply of currency, and no fears should exist as to scarcity suddenly causing disaster. Building notes to hand show a falling-off in real estate transactions in New York, Philadelphia, Chicago, and St. Louis. Permits show an increase, especially for small houses. Within thirty days all projected work, or nearly all, will be under way. The architects in these cities are enjoying a vacation well earned. They anticipate but little new work for this season's construction. The building season in Chicago and in several interior towns of Illinois will continue as late as the weather will permit. The heavy shipments of lumber to the West and Northwest betokens sharp activity during the next three months. It is possible that the great activity in railway construction in this region may be overdone. The turmoils of railway managers over rates and percentages are not reassuring. Builder's interests are, however, not jeopardised in the least, though investors in railway bonds may have to wait years for profits. There are tens of thousands of families able to live in better homes, and this unsatisfied demand courts building capital and enterprise. The masses are well employed. Labor is rising equal to the occasion. Discontent will be held in check, and fanatical zeal will be stamped out. The great body of producers are close observers of passing events and can be relied upon to do nothing to upset the general tranquility. The greatest difficulties that beset us are, what to do with our abundance and how to maintain that regular and just distribution which underlies permanent industrial prosperity. Railroad properties may not pay high divinends, but we have them to use. Banking investments may not return immense profits to the possessors, but the capital is there and must accept the most profitable employment offered. In short, if there are any troubles to be feared the producing interests do not share in them, but may safely expect to profit by the better competition and strife developing in all channels of exchange.